New Technology Symposium focuses on vector vaccines

Ceva recently held their second 'New Technology Vaccine Symposium' in Miami, USA. International Hatchery Practice was there and this article reflects on the meeting's presentations.

Ceva's Sylvain Comte looked at the global evolution of new technology vaccines and their use in the hatchery. In the four years since 2008 the percentage of global broiler production being vaccinated in the hatchery with new technology vaccines rose from 13 to 45% with the majority receiving new technology Gumboro disease vaccines.

The other new technology vaccines are for Newcastle disease and infectious laryngotracheitis (ILT). The breakdown of broilers vaccinated in the hatchery by injection (new technology and traditional vaccines such as Marek's disease) by continent is shown in Table 1. Vaccination in the hatchery allows the evolution of a specialist vaccination team and maximises the likelihood of every chick receiving a dose of vaccine.

Vector vaccine development

Moto Esaki from Ceva's Vaccine Research Group in Japan looked at the development of vector vaccines from their discovery in 1980 through to the first licence for such a vaccine being granted in 1994. There are now some 15 licensed vector vaccines, with Ceva holding seven of these licences. These cover fowl pox and herpesvirus of turkeys (HVT) vectors for diseases such as Newcastle disease, ILT, Gumboro disease, avian influenza and mycoplasmosis.

The advantages offered by vector vaccines include safety, ease of administration and their ability to tailor immune responses to specific pathogens. The future is likely to involve multivalent vector vaccines, novel vectors and the use of immunomodulators.

Table 1. Proportion of broilers vaccinated by injection in the hatchery.

Area	Vaccination (%)
North America	100
Latin America	99
Asia	56
Central & Eastern Europe	50
Western Europe	35
Africa & Middle East	19

Embryonic uniformity

The first guest speaker, Dr Marleen Boerjan from Pas Reform, then considered uniform embryonic development. Within her wide ranging paper she looked at incubator environment, incubator design, hatchery management, breeder farm management, egg quality, hatch window and brooding and how these impact on embryo/chick uniformity.

Carlos Gonzales Alonso, who is responsible for vaccination equipment and services at Ceva, then considered vaccination equipment now and in the future. It was only in the 1990s when the first in ovo vaccinator was launched and, in those early days, progress of in ovo vaccination was hampered by the lack of vaccines suitable for in ovo use (only Marek's disease vaccines).

Recently, there has been a surge in vaccination by injection with immune-complex and vector vaccines coming on stream. Other developments, such as those regarding vaccination against coccidiosis and new hatchery vaccination services programmes, have all helped to move vaccination from the farm to the hatchery.

Inadequate immunity

Thierry van den Berg from the Veterinary and Agriculture Research Centre in Belgium then spoke on vector vaccines and immunity. In particular, he addressed the issue of situations where vaccination fails to produce adequate immunity to provide protection against serious outbreaks of Newcastle disease or highly pathogenic avian influenza and where early immunity is hampered by maternal immunity. Traditional vaccination may counter clinical signs but usually does not control egg drops or viral shedding.

In such situations the use of vector vaccines, which are less sensitive to maternal antibody interference, has been shown to be very promising. In addition, recombinant (vector) HVT vaccines induce a strong cell mediated immunity.

Thierry also highlighted that the choice of the gene to be inserted into a recombinant vaccine is important, for example, among the genes of the Newcastle disease virus only the F-protein can induce an immunity that prevents cell to cell spread of the virus.

Three major changes

Dr Yannick Gardin, also from Ceva, then considered compatibility issues. There are three major changes in poultry production which will influence how we vaccinate our birds:

- The pre-eminence of the process over production, labour issues and a subsequent increasing level of automation have reduced the number of intervention points at which something can be done to the bird.
- Because of economic and sanitary reasons vaccination is now recognised as an unavoidable part of the production process.

Continued on page 25

Continued from page 23

● The new and huge opportunities offered by new technologies for the developing of vaccines and the fantastic capabilities of such vaccines.

As a consequence, vaccinations are rapidly moving to the hatchery for all bird types and to transfer for point of lay stock. So, in the not too distant future, all vaccines will be given at the same time and so it will be important to use vaccines that do not interfere with each other.

Robust immune response

Dr Francesco Bonfante from Italy detailed a study in which a newly approved vector vaccine against HPAI H5N1 containing clade 2.2 A/Swan/Hungary/499/2006 virus was tested to check its protective efficacy against a more recent and genetically distant clade 2.3.2.1 HPAI H5N1 virus from Bangladesh.

The vaccine provided complete clinical protection and suppressed the shedding of viable virus in 90% of the challenged birds. The vaccine induced a robust immune response preventing infection in the majority of the chickens.

The duration of immunity induced by Vectormune ND in layers was then considered by Ceva's Vilmos Palya. The immunity derived from a single dose of Vectormune ND at day old was followed up to 72 weeks of age and compared to more traditional Newcastle disease vaccination programmes. The vaccinated birds were regularly challenged by a velogenic strain of Newcastle disease virus.

Single vaccination with Vectormune ND at day old provided complete clinical protection from four to 72 weeks of age. There was a 3-5 $\log^{10}$ reduction in oro-nasal virus shedding and cloacal shedding was virtually non-detectable (6-7 $\log^{10}$ reduction).

Co-application of conventional vaccines in a prime-boost vaccination programme further reduced oro-nasal viral shedding.

New technology vaccines

Dr Pascal Paulet of Ceva reflected on new technology vaccines for improved and simpler vaccination. Against the backcloth of dramatic changes in poultry production, labour availability and cost issues, good disease management is essential in modern poultry production. Vector vaccines give all the benefits of modified live vaccines without any of the disadvantages.

Dr G. Donald Ritter from Mountaire Farms Inc in the USA then shared his experiences with Newcastle disease vector vaccines in the USA where the disease is typically caused by lentogenic Newcastle disease viruses.

Here HVT vector vaccines for the control of this disease have been introduced.

He described simultaneous large scale field trials on three broiler complexes in two different geographical areas. Live B1 vaccine and HVT vector NDV vaccines were used in alternating weeks over a six month period so that a meaningful comparison could be made.

Performance parameters compared included two week mortality, growing mortality, FCR and condemnations. At the end of the trial HVT vector NDV vaccination programmes were adopted in two of the three trial complexes.

Dr Luiz Sesti from Ceva Brazil then considered vector Newcastle vaccine usage in Latin America where the Newcastle disease situation is a variable picture.

Velogenic strains are endemic in Venezuela, Mexico, Columbia, Peru and Bolivia, whereas in other countries, such as Brazil, Argentina, Chile and Uruguay, their modern poultry industries claim to be free of velogenic Newcastle disease.

A series of field and controlled trials have been carried out in commercial broilers with vector HVT Newcastle disease vaccine. These trials involved three different epidemiological areas – endemic high challenge (Mexico), endemic medium to low challenge (Peru) and Newcastle disease free area (Brazil).

In all areas the vector vaccine induced significant protection against Newcastle disease as well as significant reduction in challenge virus excretion which is likely to impact on the epidemiology of the disease. Post vaccination reactions were much less evident.

Dr Ruben Ambario Orozco reflected on the use of Vectormune ND in commercial layers in Mexico where it is considered that viral challenges cost that country's layer sector at least 10 eggs per bird. The economic performance of vaccinated flocks was significantly better, as was internal and external egg quality. ■