A healthy immune system leads chickens to better respond to vaccinations

by Francesco Prandini, DVM, EMEA, Avian Technical Manager, Merial

New research into the interaction between various infectious bursal disease (IBD) vaccines and the immune system of chickens shows how the latest can be protected thanks to VAXXITEK HVT+IBD, Merial HVT-IBD vaccine against Marek's disease (MD) and IBD. The effects of vaccination with VAXXITEK HVT+IBD on the immune system of commercial layer pullets were compared with two commercial modified live (MLV) IBD vaccines.

Commercial brown pullets were split into four groups and reared in isolation rooms from day-old to 70 days of age.

Group 1 was vaccinated with VAXXITEK HVT+IBD by subcutaneous injection at day old. At 28 days of age, after IBD maternally derived antibody levels (MDA) were below IBD ELISA titres of 250, group 2 and 3 were orally vaccinated with an intermediate or with an intermediate plus IBD MLV, respectively.

Group 4 was not vaccinated against IBD and was kept as control group. All groups of pullets were vaccinated at day old with a Rispens vaccine by subcutaneous injection, with H120 against infectious bronchitis (IB) and with Avinew against Newcastle disease (ND) by eye-drop. At day 14 all groups were vaccinated with the IB 793B variant vaccine Gallivac IB88 by eye drop, and at day 21 they all received a second Avinew vaccination. A booster vaccination with Gallimune 302, an inactivated multivalent vaccine against IB, ND and EDS76, was applied to all the groups at 42 days of age. Blood samples were taken on day 28, 42 and 70.

The experiment was terminated at 70 days post hatch, when the bursa and body weight ratios were determined, with pullets vaccinated with VAXXITEK HVT+IBD showing significant higher bursa-to-bodyweight ratios than the other groups of the study. The blood samples were analysed to evaluate the relative number of circulating B lymphocytes by flow cytometric analysis. On day 28 there were no significant differences in the relative number of circulating B cells between the group vaccinated with VAXXITEK HVT+IBD and the other groups.

Fourteen days post vaccination with modified live IBD vaccines, pullets from group 2 and group 3 showed significant lower percentages of circulating B cells compared with the VAXXITEK HVT+IBD group and the controls (Fig. 1). At 70 days, ELISA results for IB, ND and EDS confirmed that pullets vaccinated with VAXXITEK HVT+IBD developed higher antibody titres against each antigen as compared with groups vaccinated with IBD MLV which may have affected the humoral immune response of the vaccinated pullets.

In summary, the results of the study showed a higher number of circulating B cells and a better response to vaccinations in pullets vaccinated with VAXXITEK HVT+IBD .

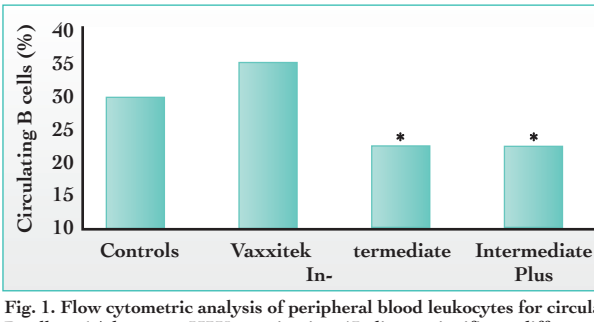

Fig. 1. Flow cytometric analysis of peripheral blood leukocytes for circulating B cells at 14 days post MLVs vaccination. *Indicates significant differences to the other groups (p<0.05; ANOVA).

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Compressed air quality in the hatchery

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Compressed air is often referred to as the fourth utility, along with electricity, oil/gas, and water[1]. As with all utilities, compressed air is not free and must be properly managed. Compressed air plays a vital role in the hatchery.

Virtually every machine uses compressed air, thus it is important to have a good working air compressor and clean air flow throughout the hatchery.

The most commonly used compressors in the hatchery are either piston or screw driven.

The piston compressor usually ranges from 1HP to 50HP. It generally requires more maintenance (runs on oil) and is louder but the cost is much less than other compressors. It is the preferred choice for the majority of hatcheries worldwide.

A screw compressor is typically in the 100HP range. They are easy to maintain and operate, and are more expensive than the piston design. The screw design allows compressing air without oil in the compression chamber. Therefore it tends to have less or no oil in the line. The screw compressor is ideal for hatcheries with large equipment, such as the in-ovo machine, that consumes a lot of CFM.

Determining the right size is an important decision for a hatchery manager and one of the most asked questions in the field.

Knowing the amount of air consumed by the equipment will help in determining the right size of compressor needed to operate equipment safely and efficiently.

The industry standard for measuring horse power is 1HP = ~4 CFM (cubic feet per minute) at 90 psi or 6.3 bars. A Zootec Double vaccinator, for example, uses 1 SCFM per cycle[2]. This means that if a hatchery uses 10 Zootec Double vaccinators, it would require at least a 4 HP piston compressor to operate all 10 machines.

A vaccinator needs to be supplied with the cleanest air possible. This is vital because the presence of oil and moisture in the air-lines will cause the machine to act erratically and eventually cause the parts to fail. Air contaminants are not always visible and can range from moisture, oil, and particles.

In order to achieve clean air in the hatchery, the air compressor needs to be equipped with an air/oil separator and dryer, and/or filters throughout the complex. Contamination is detrimental to equipment and can be prevented.

Preventive maintenance on the filters, separator, and the compressor tank is critical. It is recommended that filters are cleaned weekly and replaced as needed. Improper maintenance can lead to a pressure drop in the air system, thus affecting the equipment. It is also good practice to have air gauges on all air filters to monitor the pressure. Air gauges can indicate when it is time to change the filter elements.

To prevent rust and water damage to the compressor tank, it is important to drain any moisture on a daily basis. Draining the tank is a simple process and can be done quickly. If the hatchery has a compressor with automatic drains, they need to be checked periodically to make sure they are working properly. Also, check for air leaks and have at least one shut off valve per main air-line into a room or hallway. Big air leaks lead to inconsistency in the performance of equipment and add high costs to an operation.

Merial strongly recommends the use of a daily maintenance checklist that covers all the main points of a compressor and air-lines. Simple checks to the system will save time and money in the long run. Finding the right compressor and maintaining good air quality will keep the air compressor running strong and will help equipment, such as vaccinators, achieve optimum performance.

[1]Kaeser Compressors. [2]A SCFM meter is used to measure the air consumption.

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Hatchery vaccination to build a solid broiler immune foundation

by Stephane Lemiere DVM, Global Avian Technical Director, Merial

Broiler vaccinations are increasingly applied at the hatchery to progressively replace the administration of several vaccines on farm.

Depending on type of vaccine, hatchery equipment and organisation, different routes of administration can be used to convey an immunological product to the target cells of the embryo or of the day-old chick: injection in-ovo or subcutaneously for injectable vaccines, as well as administration via spray or oculo-nasal route for certain live vaccines.

Many thousands of day-old chicks are commonly processed every hatching day in industrial hatcheries and this allows vaccinations to be concentrated in a controlled environment, through a standardised process executed by skilled staff.

Besides the aforementioned practical advantages, hatchery vaccinations allow the earliest immunisation against pathogens that can challenge chickens in the first days of their life. Part of these vaccinations play a key role in building a solid immune foundation, with the objective to preserve a full capacity of chickens to respond to natural infectious challenges as well as to other vaccinations scheduled.

Marek's disease (MD) and infectious bursal disease (IBD), also called Gumboro disease, represent a permanent threat for the immune system of chickens, therefore efficacious vaccinations against these infections are essential to develop a strong immune foundation.

MD vaccines are normally injected subcutaneously at day old or in ovo around 18 days of incubation when embryonated eggs are transferred from setters to hatchers.

Herpesvirus of turkey (HVT) is the MD vaccine most utilised in broilers worldwide, to control the detrimental effects of an early exposure to MD virus which can cause neoplastic lesions in different organs and tissues, leading to carcase condemnation, but also depletion of lymphocytes with consequent immuno-suppression.

Taking advantage of the properties of HVT vaccine, the same strain was used as a platform to develop vector vaccines against different infectious diseases besides MD.

For instance, HVT was used to develop protection against IBD by inserting into its genome the protective gene encoding for the viral protein 2 (VP2) of the IBD virus.

Just so was developed the vector vaccine VAXXITEK HVT+IBD which, since the launch in 2006, has demonstrated its beneficial effects for the broiler industry worldwide by providing protection against two infections: MD and IBD. A single dose of the vaccine applied at the hatchery, not only induces protection against these two possible lethal diseases, but it also preserves a full integrity and functionality of the bursa of Fabricius and of the immune system. Even in presence of high levels of IBD maternally derived antibodies, VAXXITEK HVT+IBD triggers an early protection against MD and against all forms of IBD (classical, very virulent and variants).

This is achieved without facing known side effects of live attenuated IBD vaccines which replicate in the lymphocytes of the bursa causing a significant depletion with negative consequences on the immune foundation of chickens vaccinated.

Instead, chickens vaccinated with VAXXITEK HVT+IBD maintain an histological and functional integrity of their bursa, leading to a sound immune foundation with improved protection against natural infections and predisposing to an efficient take of the other vaccines administered.

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Hatchery vaccination to control velogenic Newcastle disease

by Stephane Lemiere DVM, Global Avian Technical Director, Merial

Newcastle disease (ND) is one of the most important diseases of poultry worldwide and represents a permanent threat for broiler production, as well as for the egg industry. Control of this disease, particularly of the velogenic form, is key to the poultry industry in many parts of the world to minimise the impact in terms of mortality and performance losses.

One of the strategies to control the disease is to implement early vaccination programmes starting at the hatchery, and based on the use of different types of vaccines i.e. live apathogenic/lentogenic strains of the ND virus (NDV), vector vaccines and inactivated vaccines in oil adjuvant.

In current vaccination programmes ND vaccines are frequently combined with infectious bronchitis live vaccines and with new technology Infectious Bursal Disease (IBD) plus Marek's disease (MD) vector vaccines, such as the HVT vectored vaccine VAXXITEK HVT+IBD. The latter are cell-associated vaccines to be reconstituted into an aqueous diluent prior to injection, as any Marek's disease vaccine.

Live ND vaccines, for example the Merial product AVINEW, are commonly sprayed at the hatchery by means of equipment designed for spray vaccination of day-old chicks during the process preceding their delivery to farms.

Full compatibility with cell-associated vaccines was demonstrated in laboratory controlled clinical studies through several challenge tests performed with MD, very virulent IBD and velogenic ND viruses. The results showed no differences between the combinations of vaccines and live ND vaccine alone or HVT vector vaccine alone, and the whole combined programme with live ND and IBD plus MD vector vaccine used during the same processing time. Inactivated ND vaccines are emulsified products that are subcutaneously injected in the back part of the neck region of day-old chicks. A question commonly raised is concerning the concomitant use of both types of vaccines, the oil-adjuvanted ND products and the HVT cell-associated ones.

Since the two types of vaccines are constituted of different phases, oil emulsion and aqueous suspension, respectively, they cannot be mixed with each other.

Hatchery automatic injectors were originally designed to inject aqueous cell-associated vaccine suspensions at a dose of 0.2mL per chick. More recently, new types of equipment were designed on purpose to enable dual injections of both oil emulsion and aqueous vaccines, applying three different models: dual syringes injecting both phases separately through two separate needles or dual syringes injecting both phases through the same needle or dual syringes injecting alternatively each phase through the same needle.

Controlled efficacy studies against the respective diseases (ND, MD, IBD) were performed using each type of equipment. Each group of dual vaccinated chickens, as well as those that received a cell-associated vaccine alone or an oil emulsion vaccine alone, passed all the repeated challenge tests against ND, MD and IBD.

At point of injection in the subcutaneous tissues of the neck region, whatever the piece of equipment utilised, showed both phases mixed or alternating layers of the two phases.

The way the vaccines were absorbed in vivo, enabled a proper replication of the IBD plus MD vector vaccine with a consequent stimulation of the immunity against MD and IBD, and the proper antigen presentation to the immune system of the chick to stimulate the ND humoral immunity when both types of vaccines were injected during the same operation.

Oil emulsion vaccines can be used at the same time as cell-associated vaccines.

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