Editorial

This VAXXITEK® NEWS n°4 will provide scientific information on how to build a solid vaccination program based on hatchery vaccination with VAXXITEK HVT+IBD. Over 60 papers dealing with VAXXITEK HVT+IBD hatchery vaccination have been published or presented since the beginning of research on vectored HVT-IBD vaccines in the nineties. This issue also provides information from several papers submitted to the XVIIIth Congress of the World Veterinary Poultry Association to be held in Nantes, France in August 2013.

This issue emphasizes the need of building an immune foundation to enable prevention of post-vaccine reactions, as well as to enhance vaccine take. Vaccination against the main viral immunosuppressive diseases of the chicken, infectious bursal disease and Marek’s disease, lay the ground level of the immune foundation. Visible effects on bursa health immediately show the benefit of such vaccination. A hatchery vaccination program includes live vaccines to be sprayed onto the day-old chicks to protect against the common respiratory viral diseases, Newcastle disease and infectious bronchitis. In many countries, day old programs include inactivated vaccines in oil adjuvant for Newcastle disease or Fowl Pox vaccines, plain or vectored expressing avian influenza protective antigen.

A hatchery vaccination program has to be tailored according to the country and operation epidemiological conditions that may differ from one continent to another. Areas of the world will need protection against avian influenza when in other countries this may be not needed. Velogenic Newcastle disease is a threat in many countries, but not the case in North America and Western Europe.

We hope that you enjoy reading VAXXITEK NEWS n°4 and invite you to discover and read our approach on establishing a solid immune foundation by using VAXXITEK HVT+IBD.

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How to build a hatchery vaccination program based on immune foundation?

The immunosuppression that is commonly observed in poultry production is due to many factors, including, but not only, viral diseases. Significant economic losses are attributed to immunosuppression in the poultry industry worldwide. Establishing a solid immune foundation not only enhances the immune system, but it also establishes barriers along the most common routes of infection by avian pathogens.

In building a day-old vaccination program, the compatibilities between the vaccines must be studied in order to make educated decisions on vaccine associations. Using VAXXITEK HVT+IBD as the center of a hatchery vaccination program prepares the immune system to be stimulated by concomitant and additional vaccinations. The art of combining vaccines to build a hatchery vaccination program must be according to the history of the disease challenge in the given area and the estimation of the current epidemiological risks.

1. Introduction

The objective of this newsletter is to review how to establish vaccination programs of chickens, in both short-lived birds, i.e. broilers, or long-lived birds, i.e. layers and breeders. One current trend is to move many of the vaccinations being performed in the field into the hatchery. Vaccinations in the hatchery can be administered as early as in ovo at 18 days of embryonation and also at day-old in newly hatched birds.

Novel vector vaccines are steadily increasing in use in hatchery programs. Especially, the HVT-based vaccines that protect against Marek’s disease (MD), as well as another viral diseases, such as infectious bursal disease (IBD), Newcastle disease (ND), or infectious laryngotracheitis (ILT). Hatchery vaccination programs are based on the equipment technologies available to administer the vaccines in ovo or using more conventional routes, such as spray, eye drop, or subcutaneous injections, as well as the product’s portfolio. Not all vaccines are not suitable for hatchery vaccination. The trend is to get more hatchery vaccines licensed in order to respond to the demand for more vaccines to be used in that context.

2. Immunosuppression

Immunosuppression occurs in the poultry production environment due to exposure to stressors and infectious diseases that impair immunity, as well as reduce general health, welfare, and potential for efficient production (1). Multiple stressors in the poultry house environment can insult the immune system, including viral diseases. The main consequences are significant economic losses.

2.1. Causes of immunosuppression

Among the causes of immunosuppression in poultry, the main recognized and implicated viruses are IBD, Marek’s and chicken infectious anemia (CIA) viruses (1). These viruses are known to have direct negative effects on the immune system, thereby increasing susceptibility to other diseases and interfering with vaccinal immunity (1).

2.2. Consequences of immunosuppression

In immunosuppressed birds, either the vaccine take can be decreased or the post-vaccine reaction can be excessive, following administration of live respiratory disease vaccines. Secondary bacterial infections often occur most commonly E. coli (2), that require antibiotic treatment.

2.3. Prevention of immunosuppression

Preventing economic losses is linked to control of immunosuppression in poultry production, especially broiler production (3). It may decrease mortality, increase performance, and positively impact the industry by processing birds with less health problems.

3. An Immune Foundation

A solid immune foundation not only enhances the immune system, it also establishes barriers along the most common routes of infection for avian pathogens. Breeder vaccination programs to passively protect progeny are the first approach. The second approach is to protect the growing chickens against immunosuppressive diseases and their economic consequences (3). The immune foundation is best induced by early vaccination in presence of maternally-derived antibodies, against Marek’s and IBD, both of which are main viral causes of immunosuppression. To accomplish this principal, a unique concept of vaccination was introduced worldwide in 2006: the injection, either in ovo, or at day-old, of a vector vaccine based on the HVT strain, the HVT-IBD vector vaccine, VAXXITEK HVT+IBD.
3.1. Protection of the immune function
The bursa of Fabricius is the cornerstone of immunity of the chicken, where B lymphocytes and antibody-producing plasma cells or originates. Damage to the bursa leads to immune depression. Lesions in the bursa are usually attributed to IBD virus. Marek’s disease virus can also damage the bursa and cause immunosuppression (1). Early IBD viral infection lesions appear similar to early MD viral infection lesions. The use of VAXXITEK HVT+IBD significantly protects bursal health with measurable results on the humoral immune system as well as circulating and intra-bursal B cells. Indirect measurements, such as monitoring ND vaccination, also clearly show the benefit of VAXXITEK HVT+IBD (4).

3.2. Positive interactions with other vaccinations
Examining the clearance of live IB vaccines also indicates the protective advantage of VAXXITEK HVT+IBD. Birds vaccinated with VAXXITEK HVT+IBD displayed intact bursas with significantly less IB vaccine virus detection in the IB virus target organs. The other vaccinated had regressed bursas and more re-isolation of IB vaccine viruses. This reflects the importance of bursa integrity in the clearance of the vaccine viruses hence avoiding or reducing respiratory diseases in chicks (5).

4. Compatibilities with VAXXITEK HVT+IBD
To build a vaccination program the compatibilities between the vaccines must be examined. Reviewing those studies enable making educated decisions on vaccine associations.

4.1. Marek’s disease vaccination program
Full compatibility between VAXXITEK HVT+IBD and Rispens Marek’s disease vaccines has been demonstrated (6) (Table 1).

4.2. Fowl Pox vaccines, vector or plain
Full compatibility between VAXXITEK HVT+IBD vector vaccine and Fowl Pox vectored avian influenza H5 has been demonstrated (7) (Table 1).

4.3. Live respiratory disease vaccines
Full compatibility in vivo between VAXXITEK HVT+IBD and live sprayed ND and IB live vaccines at the hatchery has been demonstrated (8) (Table 2).

4.4. Inactivated in oil adjuvant vaccines
Full compatibility between VAXXITEK HVT+IBD vector vaccine and inactivated ND vaccines in oil adjuvant has been demonstrated (9) (Table 2).

5. Incompatibilities with VAXXITEK HVT+IBD
Other HVT vector vaccines may be used for hatchery vaccination, but the main problem is that they are not compatible with each other.

5.1. HVT vaccines
A HVT-IBD vector vaccine cannot be mixed with currently registered native HVT vaccines, as both vaccine strains will compete against each other in vivo and will lead to decreased vaccine take (Merial internal study reports). This is also true for combined vaccines of HVT and Rispens, as well as HVT+SB-1 (Table 3).

5.2. HVT vector vaccines
A HVT-IBD vector vaccine cannot be mixed with other currently registered HVT vector vaccines, vector of Newcastle disease with a F protein coding gene insert (Merial internal study reports) or any vector vaccine of infectious laryngotracheitis viral glycoprotein coding gene insert (Table 3).

VAXXITEK HVT+IBD Immune foundation

| Serotype 1 Mareks vaccines, Rispens strains | SAME MAREKS DILUENT |
| Serotype 2 Mareks vaccines, SB-1 strains | SAME MAREKS DILUENT |
| Fowlpox vaccines | SAME MAREKS DILUENT |
| Fowlpox vector vaccines, FP AIV-H5, etc. | SAME MAREKS DILUENT |

| Live respiratory vaccines, Newcastle disease vaccines | IB vaccines, etc. | SPRAY CABINET |

| Inactivated in oil adjuvant vaccines, Newcastle disease, Avian influenza, etc. | NON-MISCIBLE VACCINE INJECTIONS |

Table 1: Poultry hatchery vaccine most commonly recommended associations – miscible vaccines with VAXXITEK HVT+IBD.

| HVT serotype 3 vaccines |
| HVT + Rispens vaccines |
| HVT + SB-1 vaccines |
| HVT-ILT vector vaccines |
| HVT-ND vector vaccines |

Table 2: Poultry hatchery vaccine most commonly recommended associations – non miscible vaccines with VAXXITEK HVT+IBD.
6. A la carte vaccination programs with VAXXITEK HVT+IBD

Using VAXXITEK HVT+IBD as the base for the hatchery vaccination program will prepare the immune system to be stimulated by concomitant and additional vaccinations. The art of combining vaccines to build a hatchery vaccination program has to be in accordance to the history of the disease challenge in the given area and the estimation of the current epidemiological risks.

6.1. Broiler breeders

A broiler breeder vaccination program based on VAXXITEK HVT+IBD is fully validated by wide use in many operations worldwide. Day-old or in ovo application of the vaccine is combined with other Marek’s vaccine serotypes, such as SB-1 and/or Rispens.

VAXXITEK HVT+IBD is used as a primer to immunize the chickens with re-vaccination recommended prior to the point of lay with inactivated IBD vaccines. Two primary objectives are accomplished: protection against IBD during the high risk period of pullet growth and priming in order to optimize the IBD antibody production and transmission to the progeny for passive immunity against IBD (10). Broiler breeder management and feeding procedures are key success factors; the impact of feeding systems and vaccination programs on Salmonella Enteritidis colonization and clearance of E. coli are minimal in VAXXITEK HVT+IBD + SB-1 vaccines (11).

6.2. Broilers

Broiler vaccination programs based on VAXXITEK HVT+IBD aim at immunizing against the detrimental immunosuppressive effects of both diseases, IBD and Marek’s disease. Production type and local disease challenge may necessitate an additional vaccine strain, such as SB-1, for Marek’s disease prevention. Vaccination with VAXXITEK HVT+IBD provides early onset of protection against IBD, consequently early protection of the functional immune system in short-lived chickens, and protection of the bursa of Fabricius. The overall benefit is then demonstrated by an improved control of the common secondary bacterial infections in broiler production environments, as shown by decreased condemnations at the slaughterhouse (12) or by decreased antibiotic use (13).

6.3. Layer Pullets

Layer pullet vaccination programs based on VAXXITEK HVT+IBD aim at immunizing at day old or in ovo against IBD and against Marek’s disease, as long as it is complemented by another serotype Marek’s vaccine (i.e., SB-1 and/or Rispens). The main benefit in layer type pullets is to allow protection of the functional immune system and to induce significantly increased antibody response to the crucial vaccine components of the vaccination program to protect egg production (i.e., Newcastle disease, egg drop syndrome, infectious bronchitis) (14).

The overall benefit is then demonstrated by significantly increased numbers of laid eggs and improvement of egg shell quality parameters, as compared to vaccination programs based on classical modified live IBD vaccines (15).

6.4. Special emphasis on Newcastle disease prevention

Premium vaccination programs in countries in which the velogenic form of Newcastle disease is endemic requires two injectable vaccines, VAXXITEK HVT+IBD and an oil adjuvanted ND vaccine. Both vaccines are not miscible but can be injected at the same time at day old in the hatchery. Full compatibility between both types of vaccines, cell-associated aqueous phase and oil adjuvanted phase, was demonstrated regardless of the injection system used, double needle, single needle with alternate vaccine flows, or joint vaccine flows (9). The main benefit of the use of such a combination at the hatchery is the enhanced Newcastle disease vaccine take as the result of VAXXITEK HVT+IBD vaccination (14).

References

4. Rautenschlein S, Lemiere S, Simonet S, Pronin A. Importance of the effects on the humoral and cell mediated immunity associated with HVT-IBD vector vaccine and an IBD immune complex vaccine after in ovo vaccination of commercial broilers. Article. XVIII Congress of the World Veterinary Poultry Association, Cancun, Mexico, 2013; 630-643.