Cycling of vaccine strains for effective protection against coccidiosis

Despite progress in both knowledge and methods in managing coccidiosis, the disease remains an issue of vital economic importance for the poultry sector.

Oocysts, the infectious life-cycle stage that takes place outside the host, are resilient and nearly impossible to eliminate from poultry farms.

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An effective approach in managing coccidiosis is a combination of the usage of anticoccidials and/or vaccination with a live vaccine.

New vaccines

Two new coccidiosis vaccines for chickens (HuveGuard MMAT and HuveGuard NB) were recently introduced to the European market. What makes these two vaccines interesting for discussion is the noticeably good cycling of vaccine strains.

HuveGuard MMAT contains precocious strains of Eimeria acervulina, E. maxima, E. mitis and E. tenella, species known to be of economic importance in chickens.

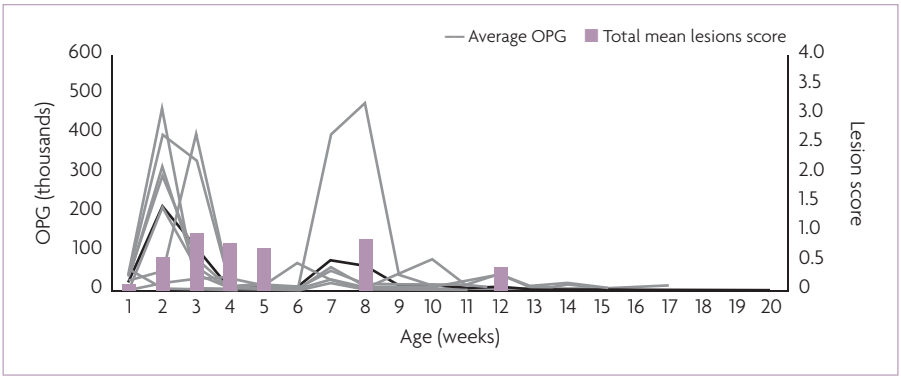


Fig. 2. Average total mean lesion score (TMLS) for different Eimeria species (E. acervulina, E. maxima, E. tenella, E. necatrix and E. brunetti) and oocyst excretion in commercial breeder and layer farms after vaccination with HuveGuard MMAT and NB.

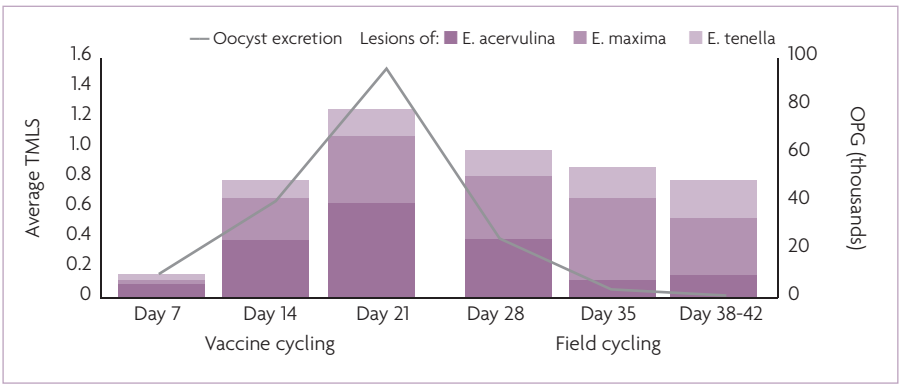
HuveGuard NB contains precocious strains of E. necatrix and E. brunetti, species that cause marked problems in birds of more than six weeks of age.

In most European countries, coccidiosis vaccination is a standard practice in breeder flocks. In breeders (and layers), vaccination is advantageous for life-long immunity build-up. In broilers, however, coccidiosis control is mainly achieved by the inclusion of infeed anticoccidials.

Vaccination is most beneficial in broilers in improving the sensitivity of Eimeria field strains to anticoccidial compounds: the 'restoration of sensitivity' concept.

This is accomplished by rotation programs between anticoccidial prophylaxis and vaccination that ultimately also helps achieve better flock performance.

Fig. 1. Average total mean lesion score (TMLS) for different Eimeria species (E. acervulina, E. maxima and E. tenella) and oocyst excretion (OPG) in commercial broiler farms after vaccination with HuveGuard MMAT.



Mode of action

Vaccination results in controlled contact of the host with different Eimeria species at an early age which allows the chicken to establish a life-long immunity to pathogenic field strains. The success of coccidiosis vaccination is influenced by two important factors: the intake of the vaccine as well as the early and consecutive cycling of the Eimeria strains in the birds and environment.

The chickens ingest live, sporulated oocysts and the different species of the parasite each subsequently replicates in a specific intestinal region.

After replication, oocysts are excreted into the litter to sporulate and be ingested, and so the cycle continues. It has been demonstrated that two to three cycles are usually sufficient for good immunity to be established.

Immunity is sustained through continuous ingestion of oocysts present in the litter: in short, a 're-vaccination or boosting'. This indicates the importance of the Eimeria species in a vaccine to be capable of replicating successfully. Special attention should be paid to vaccine application to ensure a uniform delivery to the birds.

Vaccines are applied orally and are most

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often administered to chicks either via coarse spray on day-old chicks (in hatchery or upon arrival on farm) or via drinking water.

Importance of vaccine output

European-registered coccidiosis vaccines include attenuated lines of Eimeria, meaning that strains have a decreased reproductive potential and pathogenicity, while maintaining immunogenic potential.

The attenuated Eimeria strains in the HuveGuard vaccines are said to consistently demonstrate a retained high potential for reproduction, which may be regarded as promising for an attenuated vaccine.

It results in high oocyst excretion after vaccination with correspondingly low intestinal lesion scores.

In broilers (Fig. 1) and in breeders and layers (Fig. 2), high oocyst excretions and low total mean lesion scores have been demonstrated in the field.

High oocyst excretion and cycling enhances contact of the vaccine strains with the birds, importantly with those that did not take up vaccine during mass application and is operative for the development of solid immunity.

Vaccine output is especially critical in breeders and layers as they are housed in lower density or different housing systems than broilers. Early and high oocyst output will stimulate re-infection with vaccine strains and will help to rapidly achieve a solid immunity to all the different Eimeria species (Fig. 3). Good immunity later during the production period of the birds is key.

Recent data from one European breeder company presented a significantly lower need for coccidiosis treatments in flocks vaccinated using a combination of HuveGuard MMAT and NB vaccines, in comparison to flocks vaccinated with another popular EU breeder vaccine (0.9% versus 7.1%; p-value 0.016).

Both vaccines were used in comparable conditions: similar infection pressure, application route and geographical area. For broilers, early and high vaccine strain output has another big advantage. It results in rapid populating of and cycling with anticoccidial sensitive vaccine strains in the house.

In summary, attenuated coccidiosis vaccines characterised by a high oocyst output and accordingly low intestinal lesion scores, are more robust and have attributes that induce a rapid onset of immunity in combination with limited intestinal damage. The high cycling potential of vaccine strains in breeders and layers is advantageous for a life-long immunity build-up, and in broiler farms it is important for the success of seeding the farm with anticoccidial sensitive strains. ■

Coccidiosis spray vaccination of breeders upon arrival in the rearing farm.