

How to achieve successful coccidiosis vaccination

Coccidiosis is an infectious disease caused by protozoa from the genus *Eimeria*. The parasite is host specific and has a direct lifecycle. Birds get infected by ingestion of live sporulated oocysts omnipresent in poultry houses. Once ingested by the chicken, the parasites invade and multiply in epithelial cells and hereby cause significant damage.

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The severity of infection will depend mainly upon the number of infective oocysts ingested, i.e. on the infection pressure in the poultry house.

Birds suffering from clinical coccidiosis will show typical signs like diarrhoea, bloody droppings, increased mortality, decreased feed intake and impaired performance. Insufficient control of coccidiosis also leads to impaired growth and feed conversion ratio, without the presence of evident clinical signs, so called subclinical coccidiosis or coccidiasis.

Intensive methods of production of poultry greatly favour the reproduction of *Eimeria*. As a consequence, coccidiosis is a continuing problem requiring constant attention and, in the case of broilers, a need for continuous supplementation with anticoccidial drugs or coccidiosis vaccines. The latter is becoming more important in recent years as it can be an alternative to manage coccidiosis and it can restore sensitivity of the *Eimeria* species in case of decreased efficacy of the current registered anticoccidials. The prevalence of clinical coccidiosis is estimated at 5% and that of subclinical coccidiosis at 20% of global poultry production. This demonstrates that, under current production systems, coccidiosis is still a major issue.

Coccidiosis vaccination

Coccidiosis control by means of vaccination is standard practice in breeder and layer flocks housed in alternative systems. Live vaccines are being used, resulting in



Day-old chicks spray vaccinated with coccidiosis vaccine.

controlled contact, with minimal intestinal damage, with the different *Eimeria* species at an early age of life; the contact being necessary to establish immunity against the pathogenic field strains.

The reasons to consider coccidiosis vaccination in broilers (at least those slaughtered at younger ages, six weeks of age) are different.

The main reason for vaccination in these broilers is not for immunity build-up, but for improvement of the sensitivity of the *Eimeria* field strains to anticoccidial compounds, the so-called 'restoration of sensitivity' concept.

Furthermore, changing demands of retailers for specific labels, like ABF & NAE policies are, especially in the US, drivers for the increased use of coccidiosis vaccines in broiler flocks.

The success of coccidiosis vaccination is influenced by two important parameters: the intake of the vaccine immediately after vaccination and the consecutive cycling of the vaccine. Firstly, special attention must be paid to vaccine application.

In most cases, coccidiosis vaccine administrations are mass applications by spraying the vaccine on the birds (in the hatchery or at arrival in the poultry house), spraying on the feed or by adding it to the drinking water. Although individual application of coccidiosis vaccines (for

instance by eye drop) is the golden standard for guaranteeing the correct dosing for each individual bird, it is rarely performed because it is very labour intensive.

Mass application, if not applied properly, might result in incomplete vaccination of a part of the population as not every bird will swallow equal amounts of the vaccine.

Coccidiosis vaccination in the hatchery using the spray method has long been judged as a convenient and successful method to vaccinate chicks, with coccidiosis vaccines applied to day-old chicks using standard cabinets which have been set up to maximise droplet size.

In order to optimise chances for good coccidiosis control, it is important to take notice of some specific guidelines during the application and in the management of the farm.

Correct application in the hatchery

● Temperature

A coccidiosis vaccine contains live parasites and transport and storage of the vaccine should be temperature controlled. A coccidiosis vaccine is sensitive to temperature variation. The optimal temperature for transporting and storage of the vaccines is between 2° and 8° Celsius.

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It is advisable to monitor temperatures during transport and storage and any abnormalities should be reported. Extra care should be taken to ensure the vaccine is never frozen in transport or storage as freezing oocysts will kill them. Check for cold spots in the refrigerator.

● Vaccine preparation

The dilution should always be made according to the specifications of the manufacturer for a specific vaccine. Distilled water should preferably be used as chlorinated water might have a negative effect on the viability of the parasite. In order to remove all the oocysts from the vial, it should be shaken before emptying and rinsed at least 2-3 times.

Next to diluting the vaccine with water, a dye is added to the solution. The reason for adding a dye is to make the droplets more visible to the chicks and promote preening and in this way the intake of the vaccine. The dye should be diluted according to the manufacturer's specifications.

● Application

Use a clean spraying vaccine device which provides a droplet size of $\geq 100\mu\text{m}$. In spraying devices containing a filter it is advised to remove the filter during vaccination. Once the vaccine solution is prepared it must be constantly mixed. Oocysts are heavier than water so they would sink to the bottom if not constantly kept moving (stirring can be done by means of air or magnetic rod).

It is very important that the oocysts are evenly distributed in the solution to ensure that each bird is vaccinated with the same dosage.

When the chick crates pass the nozzles of the spray cabinet, the distribution of the spray should be carefully adjusted so that it covers the entire box (not too much or too little). This should be tested and adjusted before the first batch of birds pass through the spraying machine.

The volume for spraying one box of 100 chicks is usually around 25ml. The dilution of the vaccine is calculated based on the number of chicks inside one box, the flow rate and the package of the vaccine. For example for boxes containing 100 chicks, a vaccine vial of 10,000 doses should be diluted in 2.5 litres of water, if the spray cabinet is spraying 25ml per box. This should be checked before and during application and adjusted when needed.

The spray should be coarse meaning that the chicks need to see the droplets. When a mist is created, the droplet size is set too small and the birds will be less stimulated to start preening.

A coccidiosis vaccine is intended to be ingested and not inhaled. It is important to note that an unsprayed chick does not necessarily mean that it is not vaccinated. As described below, preening is essential for vaccine uptake.



Spray vaccination in the hatchery.

● Preening

This is essentially the most important part of the vaccination as the chicks will actually be vaccinated by ingestion of droplets (preening). When the box passes under the nozzles the birds get wet and coloured (in case of using a dye). It is not because a chick has droplets on its head that it is vaccinated.

The real vaccination is obtained when they ingest the droplets from another chick in the crate. To allow preening it is important to have sufficient light after the vaccination. Ideally this light should not only come down from the ceiling but also sideways.

If crates are stacked too high the lower boxes might not get enough light and the birds will not be stimulated enough to preen. Correct temperature between 24° and 27° Celsius with no draughts in the waiting room is also important to have sufficient activity for preening. Attention should be paid so that the birds are completely dry before they get transported. It is recommended to have a period of at least 15-20 minutes before loading the crates.

Coccidiosis vaccines are live vaccines and, in order to obtain a solid immunity, each of the different *Eimeria* species in the vaccine need to replicate. *Eimeria* replication takes place in, for each species, specific regions in the intestine. At the end of the replication, new vaccine parasites are excreted and when these are again picked up by the chickens, a second wave of vaccine replication will start. It has been demonstrated that a second and even a third contact with replicating parasites is necessary to obtain solid immunity. This indicates the importance of the *Eimeria* species in the vaccine to be capable of multiplying themselves. In order to allow this cycling of the vaccine, certain measures on the farm are advisable

Management on the farm

● Preparation of the poultry house:

Before entering new birds in the house it should be thoroughly prepared. Special

attention should be given to the feeding and drinking lines. It should be carefully checked that no feed is left in the feeders or the silos from the previous flock as this might contain medication and/or anticoccidials that might interfere with the vaccine.

It is paramount for the success of a coccidiosis vaccination not to have any kind of drugs in the feed that could kill the vaccine. The same applies for the drinking water. This is especially important in the first weeks after vaccination until solid immunity has been developed.

Next to this, if vaccination is done alternately with anticoccidials between flocks, one can optimise vaccination by doing a clean up (with a chemical anticoccidial) of the flock first as this will lower the coccidiosis infection pressure considerably, giving an advantage to the vaccine strains to dominate the poultry house.

● Environment

Both temperature and humidity are very important parameters for the cycling of the vaccine. Next to the general advice for good brooding management (CO_2 : $< 2,000\text{ppm}$, maximum $3,000\text{ppm}$ / NH_3 : $< 10\text{ppm}$ /minimum 32°C at chicken height/temperature of the floor: ideal: 30°C /warm the house before placing the litter) there are specific requirements when coccidiosis vaccination is applied.

For optimal sporulation of oocysts a relative humidity in the house of 60%, a dry matter content in the litter of maximum 80% and a litter temperature of minimum 25°C is advisable. For cycling of oocysts contact between excreted vaccine and the birds is necessary. This is guaranteed if broilers are floor reared and under normal commercial density.

● Monitoring

It is advisable to monitor the flock after vaccination. This can be done by performing necropsies or by doing OPG counts. It is expected to have high OPG counts after vaccination as this is crucial to allow the vaccines to cycle. As for necropsies the ideal age of the birds to check for coccidiosis lesion would be between 15 days of age until slaughter age.

It can be expected to see some coccidiosis lesions as the birds received the parasite but the scores should not be too high and they should disappear early (earlier than normal) as the vaccine strains have a shorter life cycle and will induce lower lesions. Monitoring should be done regularly and any deviation reported to the manufacturer.

Conclusion

Coccidiosis vaccination in broilers is becoming increasingly popular. Correct application and management afterwards to allow cycling of the vaccine is crucial for successful vaccination. ■