In ovo vaccination: the hole is not the problem!

In ovo vaccination is a massive vaccination method that is able to protect poultry against a wide range of diseases by triggering an early induction of the immune response, among other benefits. Compared to day old subcutaneous vaccination or drinking water vaccination in the field, it requires less labour, its accuracy is significantly higher and it is a non-operator dependent process.

by Miren Arbe, Ceva, Spain.
www.ceva.com

In ovo vaccination is a complex process where the biology and engineering sciences are combined to deliver the correct dosage within the embryo amniotic cavity or intra-embryo. Yes, it is a fact that the process requires the perforation of the eggshell and this might be considered a risk. However, the hole is not the problem; in fact, it is not even a problem!

During any incubation process high hygiene standards are required to produce healthy day old chicks. When in ovo vaccination is conducted, these hygiene standards become even more important due to embryo sensitivity to contamination. To succeed in such a cost-effective but complex process, equipment specifically designed to be safe is paramount.

However, the quality of eggs to be injected and the environmental conditions are key. Therefore, hatching egg quality and the microbiological status of the hatchery are the main factors to keep in mind.

Fig. 1 shows the comparative performance between in ovo vaccination groups and the non-vaccinated controls at different breeder ages, expressed by the number of fully valid day old chicks compared with the number of embryos potentially valid at the time of in ovo.

According to the results, the performance of the in ovo group can be even better than the non-vaccinated group if the risk of contamination is under control and the vaccination is performed with equipment designed to be safe.

Egg quality

Egg quality is the main factor influencing in ovo vaccination performance. Low bacterial load and good quality eggshell are paramount to success.

Therefore, the objective would be to avoid in ovo vaccination of contaminated eggs (dirty or floor eggs), and reduce the risk of contamination of those good quality eggs destined to be incubated.

Once the contamination is inside the eggs there is no way back and, consequently, in ovo vaccination of contaminated eggs might be a risk for flock performance and the sanitary status of the hatchery.

Therefore, hatching eggs need to be classified by their sanitary status, separating those that are in compliance with in ovo hygiene requirements from those that are not. Floor, washed or faecally contaminated eggs will produce higher embryo mortality and lower chick quality. Moreover, the presence of explosive and rotten eggs during incubation will also be higher within the group of dirty and floor eggs, influencing the final in ovo performance.

Thus, management guidelines to reduce dirty eggs or those laid out of the nest become significantly important when in ovo vaccination is planned in a hatchery.

Fig. 2 shows the comparative in ovo performance of the same breeder flock at 39 weeks, between classified and non-classified eggs according to dirtiness.

The hatchability of viable eggs after in ovo treatment in the group where eggs were classified by removing dirty and floor eggs is higher.

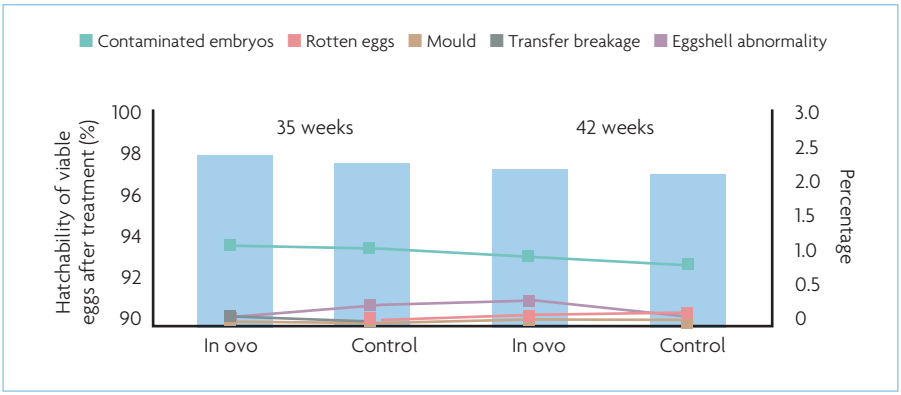
The presence of less rotten eggs leads to less contaminated embryos and therefore better hatchability performance.

Effective disinfection of hatching eggs and minimum contact with dirty surfaces is also key. From a sanitary point of view, frequent egg collection reduces their exposure time to the bacterial load in the nest and early, controlled and effective disinfection of hatching-eggs on farm and/or in the hatchery reduces the chance of contamination entering through the eggshell.

On the other hand, nests, conveyors and suction cups used on farms get dirtier the older the flocks are, and eggshell quality and its natural barrier, the cuticle, also reduces. Therefore, even if hatching egg collection and disinfection is properly done, the exposure of the eggs to these highly contaminated surfaces become an additional and critical risk for bacterial and fungal contamination.

Continued on page 27

Fig. 1. Hatchability assessment of in ovo versus control.



Continued from page 25

Accordingly, cleaning and disinfection procedures of nests, conveyors and transfer and packaging tools at farms are highly recommended practices during the whole cycle of breeder production to reduce as much as possible the risk of contamination when in ovo vaccination is planned.

Microbiological status

The microbiological status of a hatchery is determined by the quality of the environment and the efficacy of cleaning and disinfection procedures of the facilities and materials involved in the incubation process. Thus, depending on each hatchery's conditions, the impact that in ovo vaccination might have on performance will vary. Ensuring and controlling a good microbiological status of the hatchery is a key factor to success when vaccinating in ovo.

As mentioned before, cross contamination of embryos could come about before eggs arrive at the hatchery. However, the risk of contamination during incubation, just after vaccination or during the time the perforated eggs are stored inside hatchers, will depend on what hygienic or environmental conditions they are exposed to.

Accordingly, evaluation of the risk of contamination when in ovo vaccination is conducted, is based on a full microbiological screening of the hatchery in order to diagnose if there is a real risk of cross contamination due to the sanitary status of the hatchery.

The aim of microbiological screenings is to evaluate and monitor the real efficacy of cleaning and disinfection protocols in place and to identify critical points of the production flow, if any.

This highlights that the microbiological status of a hatchery is in constant change and is highly dependent on the quality of eggs processed. Cleaning and disinfection action plans need to be customised and dynamic to continuously improve hatchery sanitation. The implementation and verification of an effective action plan will lead to high level hygiene and the recommended scenario during in ovo vaccination.

Equipment designed to be safe

As mentioned at the beginning of the article, in ovo vaccination is a complex process where the biology and engineering sciences are combined to deliver the correct dosage within the embryo amniotic cavity or intra-embryo.

From the technical point of view, in ovo traditional injection systems on the market are based on fix depth technology. It means injection depth is always fixed within the eggs. In other words, when small eggs are processed and/or embryo development is in the upper limit to be vaccinated in ovo, the depth of injection does not adapt and there might be risk of deep intra-embryo injection that might lead to a negative impact on hatchability.

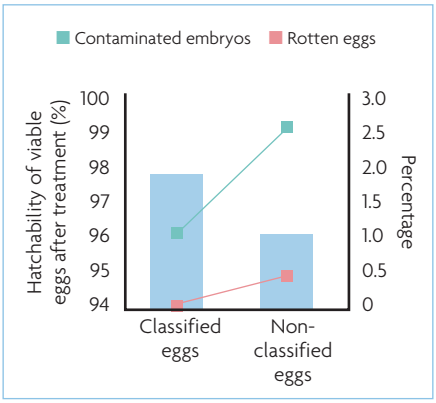


Fig. 2. Comparative in ovo performance of the same breeder flock at 39 weeks, between classified and non-classified eggs.

However, science and technology has advanced and brought to the market a new innovative and patented technology: the Egginject Dual Pressure System.

Egginject technology not only offers all the benefits of in ovo vaccination itself, it has been designed to be safe. An accurate dosage of vaccine in the target embryo compartments is located with negligible impact on hatchery performance thanks to the adaptability of the injection depth.

High pressure is used first on a very small area of contact to perforate the eggshell and, once the needle is inside the egg, the system adjusts the pressure to automatically define the injection depth depending on the embryo position and size, regardless of the size of the egg. Moreover, the needle used is less sharp, compared to needles of traditional systems, and therefore reduces the risk of embryo injury even more.

From the sanitary point of view, Egginject has a double disinfection system to reduce the risk of contamination during injection. The egg's surface is disinfected with a peroxide-based sanitiser before injection, and each needle or perforator is disinfected with a chlorine-based sanitiser after each injection to complete the double disinfection system. This is how hygiene conditions are maximised and the risk of cross contamination derived from the egg's microbiological status and the vaccination process itself is minimised. Regarding the perforation itself, the diameter of the needle used in Egginject to perforate the eggshell, is smaller than the perforator used in traditional systems. Therefore, the piece of eggshell that might enter the egg because of the perforation is smaller and in any case, previously disinfected.

In traditional systems, the diameter of the hole is bigger, and as there is no previous disinfection of the eggshell, the entrance of a bigger piece of non-disinfected eggshell, added to fix depth technology, might lead to a higher risk of deep infection.

Conclusion

Hatchery performance when in ovo vaccination is conducted can be similar or even better than when in ovo is not conducted. The key is that the hole is not the problem. The quality of the injected eggs matters, as well as proactive control of the environment, where the process takes place, and the in ovo equipment used.

In relation to the equipment, the major innovation in the in ovo market is the Egginject Dual Pressure Injection System which is designed to be safe.

In relation to the full control of the process, Ceva's in ovo C.H.I.C.K. Program offers a complete package of services to maximise and control the hygiene process from egg quality to hatchery sanitation and through to the vaccination process itself.

Through regular monitoring and training the critical factors affecting the process will be under control and such a complex process will become part of the routine vaccination practice at the hatchery. ■

Left, the Dual Pressure System and, right, a traditional system.