Comparison of two IBD vaccinations in laying hens: benefit on growth, homogeneity of vaccination and production performances

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SUMMARY

The objective of this field trial, conducted on hens, was to evaluate the effects of vaccination with a turkey herpes virus (HVT) plus infectious bursal disease virus (IBDV) vector vaccine (VAXXITEK® HVT+IBD) compared to a classical IBD intermediate vaccine, on zootechnical and health parameters. A group of 272 day-old pullets was vaccinated at the hatchery with VAXXITEK HVT + IBD (VAXXITEK group). Another group of 272 day-old pullets (Control group) was vaccinated with a classical IBD intermediate vaccine at 3 and 4 weeks of age. The following parameters were monitored: body weight evolution and homogeneity during the growing phase, and laying rate and egg quality during the egg production phase. A serological follow-up was implemented to evaluate the antibody titres against IBD virus (IBDV), infectious bronchitis virus (IBV), avian pneumovirus (APV) and Newcastle disease virus (NDV). The results of the study support a higher efficacy and safety of VAXXITEK HVT+IBD as compared to the classical IBD intermediate vaccine, on zootechnical and health parameters. The following parameters were monitored: body weight evolution and homogeneity during the growing phase, and laying rate and egg quality during the egg production phase. A serological follow-up was implemented to evaluate the antibody titres against IBD virus (IBDV), infectious bronchitis virus (IBV), avian pneumovirus (APV) and Newcastle disease virus (NDV). The results of the study support a higher efficacy and safety of VAXXITEK HVT+IBD as compared to the classical IBD intermediate vaccine, on zootechnical and health parameters.

Keywords: HVT+IBD Vector vaccination, Infectious Bursal Disease, IBD intermediate vaccine, zootechnical parameters, health parameters, laying hens

RÉSUMÉ

Comparaison de deux vaccinations IBD chez les poules pondeuses : bénéfice sur la croissance, l’homogénéité de la vaccination et les performances de production

L’objectif de cet essai, mené sur des poules en croissance puis en ponte, est d’évaluer l’impact d’un vaccin recombinant HVT+IBD (bursite infectieuse sur vecteur herpes virus de la dinde), par comparaison avec un vaccin IBD classique, sur les paramètres zootechniques et sanitaires. Au total, 589 poulets ont été inclus au coupou, où 272 y ont reçu le vaccin HVT+IBD (groupe VAXXITEK HVT+IBD, 1er jour de vie). Les 272 autres animaux ont été vaccinés avec le vaccin IBD classique, à 3 puis 4 semaines d’âge (groupe contrôle). L’évolution du gain de poids et l’homogénéité durant la phase de croissance, puis le taux de ponte et la qualité des œufs ont été mesurés. Un suivi sérologique a été réalisé afin d’évaluer la protection contre l’IBD, la bronchite infectieuse (IB), l’infection à pneumovirus aviaire (APV) et la maladie de Newcastle (ND). L’étude montre l’effet positif et l’innocuité de VAXXITEK HVT+IBD par comparaison au vaccin IBD classique sur l’évolution de la courbe de poids durant les 15 semaines de croissance (p=0,022), le poids vif à 10 semaines (931,7 g et 905,2 g de poids vif respectivement, p<0,001) et à 15 semaines (1323 g et 1303 g de poids vif respectivement, p=0,023), la production d’œufs commercialisables (66 464 œufs et 65 464 œufs respectivement, p<0,001), la force de fracture (38,845 N et 38,075 N respectivement, p<0,001, soit une différence de 3,88 œufs par hen), l’unité de Haugh (89,56 U et 88,59 U respectivement, p=0,012) et shell breaking strength (38,845 N et 38,075 N respectivement, p=0,022) during the laying phase. Globally, the serological response against IBDV, IBV, NDV and APV was not impaired in either group, but was more homogenous against IBDV in birds vaccinated with VAXXITEK.

Keywords : Vaccin recombinant HVT+IBD, bursite infectieuse, vaccin intermédiaire IBD, paramètres zootechniques, paramètres sanitaires, poules pondeuses.

Introduction

Infectious Bursal Disease (IBD) is a highly contagious viral infection in young chicken. The disease is distributed worldwide and is of major concern to the poultry industry. Besides, IBD virus being highly resistant to inactivation, vaccination is inevitable. Breeders are vaccinated prior to the onset of lay with inactivated oil-emulsified vaccines which induces high antibody titers, passively transmitted to the offspring. Most commonly, chickens are immunized with live vaccines of various virulence (classified according to their degree of attenuation as mild, intermediate, intermediate plus and hot [5]). The time-point of vaccination is crucial because maternally derived antibodies might neutralize the vaccine. The vector vaccine VAXXITEK HVT+IBD is an interesting alternative since it overcomes this problem [3]. It is produced by inserting an IBDV viral protein 2 (VP2) gene expression cassette into the genome of turkey herpes virus (HVT) genome. Chicks are injected once with the vector
vaccine VAXXITEK HVT+IBD at hatchery, at the same time as other handlings, while live vaccines are administered twice at 3 weeks and 4 weeks of age which might add another stress during a critical period. That could impact the immune system and also the whole production. Lastly, all live vaccines, except “mild” virulence, can induce moderate to severe bursal lesions and, consequently, immunosuppression. Different studies have been performed about the VAXXITEK HVT+IBD comparing different vaccination programs in the face of high-titrated maternally derived antibody [3, 10], on humoral immune response and on protection against different strains of IBDV [6, 2]. Nevertheless, there are few studies about effect of VAXXITEK HVT+IBD on production results, particularly in laying hens flocks. The objective of this study was to evaluate the effect of VAXXITEK HVT+IBD vaccination versus a classical IBD intermediate vaccine under field conditions on a French commercial farm of laying hens during growing and laying phase. It was a comparative, controlled, half-blinded study with a follow-up of the study animals from hatchery to the end of the laying period. Most field studies in poultry are designed as batches comparisons, frequently with non-contemporary batches. In this study, control and tested animals were raised together, in the same conditions, within the same building. Statistical processing was optimized with comparable data which ensure a true reliability.

**Materials and methods**

**STUDY DESIGN**

As a whole, 589 Hy Line Brown chicks were enrolled in the study and were arbitrarily allocated to a treatment group at the hatchery. Twenty chicks per group were humanely euthanized on D1 to provide a blood sample in order to establish a serological status at baseline concerning IBD and main pathologies (avian pneumovirus, Newcastle disease, infectious bronchitis). Half of the animals (n=272) were subcutaneously vaccinated at one day-old at the hatchery with VAXXITEK HVT+IBD (VAXXITEK group) by a dedicated technician; the other half (n=272) didn’t receive any IBD vaccination at one day-old but were vaccinated twice with an intermediate strain vaccination, administered by an eye-drop on weeks 3 and 4 of age (Control group). No HVT alone vaccination was applied in the Control group. Animals of both groups received the same other routine vaccinations on farm (Table I).

All animals were individually identified by a wing tag to allow an individual follow-up. At arrival on farm (D1), chicks were dispatched within 8 cages per group (34 subjects per cage), with groups alternatively disposed in the same row. On D29, density was reduced by removing half of animals from each cage into a lower floor. Water was provided by nipples and the feed was the same as for the rest of the batch raised in the building. Lighting was planned following the usual schedule for commercial growing hens. When animals were transported to the hen laying house on week 18, a new distribution within groups was made, taking into account the weight distribution on week 15. Animals that had lost their wing tag were finally put in other cages and excluded of the study. The study animals were the first ones entering this laying house that was recently built. As in growing hen building, feed was automatically distributed and was the same feed as in the rest of the building.

The farmer recorded daily: mortality, concomitant treatments and diseases, and egg production. From hatchery until week 65, animals were submitted to the follow-up program detailed in Table III.

<table>
<thead>
<tr>
<th>Age</th>
<th>VAXXITEK* Group</th>
<th>Control Group</th>
<th>Admin. Way</th>
<th>Date</th>
<th>Commercial name</th>
</tr>
</thead>
<tbody>
<tr>
<td>D 15</td>
<td>W2</td>
<td>IB</td>
<td>IB</td>
<td>Spraying</td>
<td>04/03/11</td>
</tr>
<tr>
<td>D 21</td>
<td>W3</td>
<td>APV</td>
<td>APV + Gb</td>
<td>Drop in eye</td>
<td>10/03/11</td>
</tr>
<tr>
<td>D 28</td>
<td>W4</td>
<td>Gb</td>
<td>Drop in eye</td>
<td>17/03/11</td>
<td>Poulvac* Bursine 2</td>
</tr>
<tr>
<td>D 36</td>
<td>W6</td>
<td>PMV1</td>
<td>PMV1</td>
<td>Drop in eye</td>
<td>25/03/11</td>
</tr>
<tr>
<td>D 49</td>
<td>W7</td>
<td>IB, ND</td>
<td>IB, ND</td>
<td>Spraying</td>
<td>07/04/11</td>
</tr>
<tr>
<td>D 63</td>
<td>W9</td>
<td>LT</td>
<td>LT</td>
<td>Water</td>
<td>21/04/11</td>
</tr>
<tr>
<td>D 83</td>
<td>W12</td>
<td>IB</td>
<td>IB</td>
<td>Spraying</td>
<td>11/05/11</td>
</tr>
<tr>
<td>D 98</td>
<td>W14</td>
<td>EM</td>
<td>EM</td>
<td>Drop in eye</td>
<td>26/05/11</td>
</tr>
</tbody>
</table>

Table I: Vaccinations performed on farm

**IR: Infectious bronchitis disease, APV, Avian pneumovirus disease, Gb: Gumboro Disease, PMV1,ND : Newcastle Disease, LT: Laryngotracheitis, EM: Avian encephalomyelitis virus**

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To compare the VAXXITEK HVT+IBD vaccination with a classical IBD intermediate vaccine on laying hens, the following parameters were chosen. The main criteria during the growing pullet phase were the evolution of mean weight between D1 and W15 and the homogeneity of weights (by analyzing standard deviation) on D1, W5, W10, W15. The main criteria during the laying hen phase were the egg production from W18 to W65, and the egg weight. The secondary criteria were the egg quality (breaking strength, Haugh units, hardness and colour), the evolution of antibodies levels against main pathologies, the homogeneity of serological vaccine response, and the mortality and morbidity rates.

Animals were individually weighed with a calibrated scale, fitted with a cone to contain the animal during weighing. This procedure was always made at the same hour of the day. Serological status at baseline was given by humane euthanasia of 20 chicks per group for blood sampling. Afterwards, 40 animals (20 per group) were randomly chosen at 28 days. These animals were blood-sampled on week 4, 10, 15, 20, 25, 35, 45, 55 and 65 to allow a reliable follow-up of serological kinetics (1 ml blood / animal). Antibody titers were determined at each date for IB, IBD, APV by ELISA and ND by IHA. A BioCheck ELISA kit was used for the detection of IBD antibodies. On day 28, a specific monitoring by IBD+ ELISA (PROFLOCK® Plus IBD antibodies test kit, Synbiotics) was also performed. This test allows a more accurate detection of IBDV protective anti-VP2 antibodies.
Only marketable egg production was recorded. Eggs were kept out of the egg conveyor by a metal thread, and counted manually every morning. Egg characteristics were measured on the total production of one day (at least a total of 200 eggs per group and day) and defined as follow:
- Egg weight: mean egg weight (+/- 0.1 g).
- Colour: data given by an index = L-a-b (L: black / white contrast; a: red / green contrast; b: blue / yellow contrast). The lower is the value, the deeper is the colour. It is an indicator of health status of the farm.
- Static hardness of the egg’s shell: expressed in Newton/mm² of eggshell thickness, measured under a constant force of 15 Newton, with a compression speed of 30 mm/mn. This measurement characterizes the deformation of the shell. The less the shell deforms, the stronger it is.
- Breaking strength of the shell (in Newton), measured with a compression speed of 30 mm/mn. This measures the fracture force: the maximum force applied on the egg before fracture of the shell. The precision is 0.1 N.
- Albumen height (+/- 0.1 mm) measured with an electronic micrometer, allowing calculation of Haugh units. These units can vary in case of pathology and become lower when the hen is becoming older. It is also used as an evaluation of the freshness of the egg.

**STATISTICAL ANALYSES**

Weight at 5 weeks of age is a predictive value of production performances [8]. Sample size was determined considering a growing hen weight objective of 400g at 5 weeks, with a standard deviation of 40g. According to these hypotheses, the minimal sample size to be able to demonstrate a difference of body weight of 20g with 5% first risk error and 80% power was 62 animals per group. Actually, 272 hens per group were included for growing phase, and more than 230 cases were followed per group in the laying phase. Statistical units were respectively the study animals for the weight and the serological results, the egg for the qualitative parameters, and the hen for the daily egg count.

Body weight, average daily weight gain, egg weight, egg-quality parameters and antibody statuses (except ND) are normally distributed (or normalized for some antibody titres). They were analysed by Student's t-test or ANOVA. ND antibodies status was a not-normally distributed data compared using a Kruskal-Wallis test. Egg production was analysed with a χ² analysis performed on the daily laying rate. Every day, the number of eggs recorded was transformed into a laying percent by considering the number of present hens in the cage. Laid eggs were combined by week in order to smoothen the data (daily production was not recorded exactly every 24 hours, leading to rates over 100%). Mortality rate was also analyzed with a Pearson's χ² test. Homogeneity of data was analyzed by a comparison test of variance, or by a Bennett's test for variation coefficient. Statistical analyses were performed using SYSTAT® 12 software and RGui software version 2.15.0. Figures were performed using EXCEL® and R software.

**Results**

On D1, mean weight was 35.41 ± 8.4 g for Control chicks and 35.57 ± 7.5 g for VAXXITEK HVT+IBD animals. Initial weight was not significantly different between groups (p=0.505). Standard deviation was not found different between groups (p=0.375), showing that both groups were comparable at baseline. Serological status on D1 was also not different between groups regarding antibodies levels for tested pathologies (Table IV).

**GROWTH AND HOMOGENEITY**

Whatever the moment of the study, weight data were normally distributed.

During growing phase, global ANOVA analysis showed that there was a significant difference between groups for evolution of body weight (p=0.022). Hens from VAXXITEK HVT+IBD group had a significantly higher body weight compared to Control group on week 10 (931.7 ± 73.0 g and 905.2 ± 73.0 g respectively, p<0.001) and week 15 (1323 ± 92.3 g and 1303 ± 92.3 g respectively, p=0.023) (Table V). Test on equality of variances by date show that groups remained with a comparable homogeneity during growing phase. Mean weight during growing phase showed a variability of ± 8.59% for Control group and ± 8.49% for VAXXITEK HVT+IBD group. Average daily weight gain from D1 to W15 was not significantly different between groups (p=0.073).

At the beginning of laying phase (first weighing at week 20), both groups had comparable mean weight: 1.632 kg for Control group vs 1.645 kg for VAXXITEK HVT+IBD group (p=0.191). Homogeneity of body weights was also not different at that date (Test of equality of variances, p=0.271). For the following analyze, weight data during laying phase were adjusted on initial mean weight on week 20. Mean weight values are shown in table VI. Hens kept on increasing body weight during laying period (significant ANOVA for time factor), even if it was at a lower rate compared to growth phase, but not differently between groups (p=0.700). Homogeneity remained comparable between groups during laying period: variance test at each date showed no significant difference. Final body weight was not different between VAXXITEK HVT+IBD and Control groups (1882.68 g and 1874.20 g respectively, data adjusted on D1 weight, p=0.700). Average daily weight gain from W20 to W65 was normally distributed and was not significantly different between groups: 0.752 g/d for Control group and ± 8.49% for VAXXITEK HVT+IBD group. Average daily weight gain from D1 to W15 was not significantly different between groups (p=0.073).

**PRODUCTION PERFORMANCES**

The number of produced marketable eggs was recorded from week 18 until week 65 (Table VII). The marketable egg production was higher for VAXXITEK HVT+IBD group compared to Control group (66 464 eggs and 65 564...
eggs respectively, p<0.001). As a result, a total of 900 more marketable eggs were produced in VAXXITEK HVT+IBD group during the study. This represents 3.88 more marketable eggs by present hen during the 47 weeks of production. Taken by cages and throughout the period, this studied parameter showed a moderate variability (Figure I).

Egg weight data are presented in Table VIII. Global analysis shows that eggs were significantly heavier in VAXXITEK HVT+IBD group than in Control group (+1.2g in average, p<0.001). By date, eggs were significantly heavier in VAXXITEK HVT+IBD group than in Control group (+1g, +1.3g and +2g in average for respectively W45 (p=0.024), W55 (p=0.015) and W65 (p=0.024)).

Egg quality measurement was implemented on 4 dates 10 weeks apart during laying phase. The means of measured characteristics are presented in table IX. A significant

<table>
<thead>
<tr>
<th>Weight*</th>
<th>D1</th>
<th>D28</th>
<th>D35</th>
<th>W10</th>
<th>W15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date</td>
<td>17/02/11</td>
<td>17/03/11</td>
<td>24/03/11</td>
<td>24/04/11</td>
<td>01/06/11</td>
</tr>
<tr>
<td>Mean weight Control group (g)</td>
<td>35.5</td>
<td>274.1</td>
<td>378.9</td>
<td>905.2</td>
<td>1303</td>
</tr>
<tr>
<td>Mean weight VAXXITEK® group (g)</td>
<td>35.5</td>
<td>271.6</td>
<td>377.3</td>
<td>931.7</td>
<td>1323</td>
</tr>
<tr>
<td>T Test by date</td>
<td>p = 0.672</td>
<td>p = 0.754</td>
<td>p&lt;0.001</td>
<td>p = 0.023</td>
<td></td>
</tr>
<tr>
<td>F Test of variance</td>
<td>p = 0.695</td>
<td>p = 0.573</td>
<td>p = 0.823</td>
<td>p = 0.534</td>
<td></td>
</tr>
</tbody>
</table>

Global (N = 476) Repeated measures ANOVA on weight: p = 0.022

* Computed on adjusted data: it means that weight at D1 was fixed at the mean value of 35.5 g for both groups to allow statistical comparison, and those later weights were corrected according to this initial setting.

Table V: Mean weight results during growing phase by group, significance of statistical results

<table>
<thead>
<tr>
<th>Weight*</th>
<th>W 20</th>
<th>W 25</th>
<th>W 35</th>
<th>W 45</th>
<th>W 55</th>
<th>W 65</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date</td>
<td>07/07/11</td>
<td>12/08/11</td>
<td>20/10/11</td>
<td>30/12/11</td>
<td>09/03/12</td>
<td>16/05/12</td>
</tr>
<tr>
<td>Mean weight Control group (g)</td>
<td>1637.5</td>
<td>1700.3</td>
<td>1778.9</td>
<td>1848.6</td>
<td>1883.7</td>
<td>1874.2</td>
</tr>
<tr>
<td>Mean weight VAXXITEK® group (g)</td>
<td>1637.5</td>
<td>1700.8</td>
<td>1781.1</td>
<td>1857.3</td>
<td>1882.4</td>
<td>1882.68</td>
</tr>
<tr>
<td>Variance test</td>
<td>p = 0.870</td>
<td>p = 0.873</td>
<td>p = 0.995</td>
<td>p = 0.977</td>
<td>p = 0.776</td>
<td></td>
</tr>
</tbody>
</table>

Global (N= 427) Repeated measures ANOVA: p=0.700 for groups, p < 0.001 for time

* Computed on adjusted weight at W20.

Table VI: Mean weight per group during laying phase, significance of statistical analysis

<table>
<thead>
<tr>
<th>On period W18 – W65</th>
<th>Number of produced eggs</th>
<th>Laying rate</th>
<th>Sample size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control group</td>
<td>65 564</td>
<td>87.89 %</td>
<td>250 hens (5 cages)</td>
</tr>
<tr>
<td>VAXXITEK® group</td>
<td>66 464</td>
<td>89.07 %</td>
<td>250 hens (5 cages)</td>
</tr>
</tbody>
</table>

Table VII: production performances during laying period by group

<table>
<thead>
<tr>
<th>Mean Egg weight</th>
<th>Control group</th>
<th>VAXXITEK® group</th>
<th>Statistical analyses</th>
<th>n total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>62.4 ± 6.37 g</td>
<td>63.6 ± 6.37 g</td>
<td>p&lt;0.001</td>
<td>1787</td>
</tr>
<tr>
<td>Week 35</td>
<td>62.1 ± 6.34 g</td>
<td>62.7 ± 6.35 g</td>
<td>p = 0.099</td>
<td>477</td>
</tr>
<tr>
<td>Week 45</td>
<td>62.4 ± 6.34 g</td>
<td>63.4 ± 6.34 g</td>
<td>p = 0.024</td>
<td>409</td>
</tr>
<tr>
<td>Week 55</td>
<td>62.7 ± 6.35 g</td>
<td>64 ± 6.35 g</td>
<td>p = 0.015</td>
<td>434</td>
</tr>
<tr>
<td>Week 65</td>
<td>62.5 ± 6.35 g</td>
<td>64.4 ± 6.34 g</td>
<td>p = 0.024</td>
<td>467</td>
</tr>
</tbody>
</table>

Table VIII: Mean egg weight by group
difference was shown for breaking strength, with stronger eggs in VAXXITEK HVT+IBD than in Control group on global analysis (38.845 N and 38.075 N respectively, p=0.022). By date, significant differences are observed on W35 (40.9 N and 39.7 N, p=0.049) and W55 (38.0 N and 36.2 N respectively, p=0.015) (Figure II). Haugh units measurements reveal a better albumen quality in VAXXITEK HVT+IBD group on global analysis (89.56 U and 88.59 U respectively, p=0.012). All the other egg quality parameters (colour, static, hardness) were not significantly different between groups.

SEROLOGICAL PROFILES BY GROUP

Serological follow-up by group for IBD from W4 up to W65 is shown by the Figure III. Evolution from 28 days to 65 weeks showed no significant difference between groups for levels of antibodies against infectious bursal disease (p=0.767). Dispersion of data was not found different between groups in the early weeks of the study (from D28 to W10). From W15 to the end of the study, distribution of antibody levels was significantly narrower for VAXXITEK HVT+IBD group compared to Control group (table X). These significant results can be graphically observed, for example on W15 and W45 in Figure IVa and Figure IVb.
Evolution from D28 to week 65 showed no significant difference between groups for levels of antibodies against infectious bronchitis (p=0.881). Except for one date (W15, p=0.045), protection level against infectious bronchitis remained as homogenous in VAXXITEK HVT+IBD group as in Control group.

Evolution from D28 to W65 showed no significant difference between groups for levels of antibodies against APV (p=0.984). Distribution of individual antibody levels against APV, that was comparable between groups on W10, became more homogenous on W15, W20 and W25 for VAXXITEK HVT+IBD group compared to Control group. On week 35, the antibody level distribution was more homogenous in Control animals as in VAXXITEK HVT+IBD group. The antibody level distribution was similar on weeks 45, 55 and 65 (Table XI).

Antibody levels against Newcastle disease were globally not found different between groups, except on week 25 when median was significantly higher for Control animals than for tested animals (Table XII).

**SEROLOGICAL MONITORING VP2 RESPONSE**

IBD+ ELISA analysis reacts specifically to antibodies against VP2 protein expressed by the vector vaccine [1]. Distribution of these individual antibody levels at 28 days is...
detailed in Figures Va and Vb. The ELISA IBD performed on Day 28 showed that 100% of samples were below 1500 and geometric mean is 147.8, allowing interpretation of the IBD+ analysis. The comparison between groups for this IBD+ analysis shows a significantly higher rate of positive serum for animals in the VAXXITEK HVT+IBD group: the Student test performed on normalized data (log) shows a p-value of 0.049.

**Mortality Rate per Group**

Considering growing period, mortality rate was not significantly different between groups, with 3.24% for VAXXITEK HVT+IBD group and 1.65% for Control group (p=0.257). When analyzing global period, mortality rate was not significantly different either, with 5.67% for VAXXITEK group and 4.55% for Control group.

**Morbidity**

During the study, the following concomitant pathologies were observed in the buildings and could possibly affect equally both groups of study animals.
- Diarrhoea after Coccidiosis outbreak in July 2011 (W20 to W21) and December 2011 (W45 to W46), treated by oxytetracyclin.
- Red mites outbreak in March and April 2012 (on W55, 56 and 59), treated by spraying phoxim.
- The other concomitant treatment was THELMIZOLE 20% (levamisole) on W9 and W15 in drinking water.

No acute fall in number of laid eggs was noticed at these moments. Weight evolution didn’t seem to be affected either (no decrease in weight) during laying period.

**Discussion**

In this study, the laying building was new at the entry of the study animals. The germ pressure may also have been low, but it was not measured since there were no unvaccinated animals. On the contrary, breeding buildings were rather ageing, and we can assume that pullets were probably exposed to usual diseases and parasites on field, and arrived in laying building with their own pathogens. The fact that some coccidiosis happened at the beginning of laying period, and the fact that red mites managed to develop, demonstrate that pathogens quickly settle in a clean environment, despite strict biosecurity measures.

Serological results recorded in this study for IBD antibody response provides ambivalent clues. Indeed, with classic IBD ELISA, a lot of animals exhibit high antibody levels. Considering a threshold of 7000, around 20% of the samples exceeded this limit, mostly in Control group (Figure VI). The classic IBD ELISA data are not sufficient to reveal exposure to wild IBDV strain: classic IBD ELISA is not capable of differentiating antibodies between chickens vaccinated with classical live vaccine and infected chickens [7, 9].

The combined use of other investigations, histological tests and molecular research (PCR) of IBDV wild strain were not performed in absence of clinical Gumboro signs. A sentinel group made of non-vaccinated animals wouldn’t have provided information about wild virus circulation because vaccinal particles can diffuse horizontally by faecal excretion with live vaccines [4].
The analyses of serological profiles showed comparable evolution of average level of antibodies against main pathologies such as infectious bronchitis, avian pneumovirus and Newcastle disease. Concerning avian pneumovirus, protection was also potentially improved in VAXXITEK HVT+IBD group from week 15 to week 25, whereas there was no difference concerning infectious bronchitis.

For this trial, chicks were randomized and enrolled at hatchery, followed for zootechnical parameters (weight, egg production and quality). All the animals received the same routine vaccinations except for IBD and were raised in the same conditions, in a commercial batch.

This study highlights the improvement of production performances for the HVT-IBD vector vaccine group in comparison with the conventional IBD live vaccine group. Global ANOVA analysis showed an improvement in body weight evolution in the 18 weeks growing phase for the test group: global body weight (p=0.022), body weight on week 10 (931.7 g vs 905.2 g, p<0.001) and on week 15 (1323 g vs 1303 g, p=0.023); otherwise, homogeneity was comparable for the 2 groups. Throughout the laying period, production results were significantly improved for the test group as follows: average laying rate (89.07 % vs 87.89 %), 3.88 extra marketable eggs in 47 weeks of lay (p<0.001), average egg weight (63.6 g vs 62.4 g, p<0.001), Haugh units (89.56 U vs 88.59 U, p=0.012) and breaking strength (38.845 N vs 38.075 N, p=0.022).

Among several parameters linked to the properties of the vaccine itself, the improvement of production performances might be attributed to the moment of the vaccination, which avoids adding another stress during a critical period that impacts the immune system and the whole production on the long term.

As a conclusion, this controlled, half-blinded field trial conducted from hatchery to the end of laying period supports the efficacy of the tested IBD vaccination by a vector vaccine at hatchery (VAXXITEK HVT+IBD) compared to a classical vaccination at 3 and 4 weeks of age in hens on both zootechnical and health parameters.

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References