THE EFFECTS OF VACCINE STRAIN, ROUTE OF ADMINISTRATION OF IB VACCINE AND REVACCINATION ON EGG PRODUCTION AND EGG QUALITY IN LAYING HENS

A. SULAIMAN, J.R. ROBERTS and W. BALL

Summary

Different vaccination protocols for infectious bronchitis (IB) virus were administered to Isa Brown laying hens. Half the birds were revaccinated regularly during lay whereas the other birds were not vaccinated beyond 14 weeks of age. Body weight, production, blood haematocrit and plasma electrolyte concentrations were not affected by vaccination treatment. However, egg and egg shell quality differed between birds which were revaccinated regularly and those which were not. In general, egg shell quality was better in the birds which were not revaccinated at regular intervals. The birds which were vaccinated initially with the A3 vaccine tended to have lower albumen height and Haugh Units than the other treatment groups. The IB antibody titres were greatest at 6 and 16 weeks for both revaccinated and non-revaccinated birds. However, regular revaccination of birds beyond 14 weeks of age had no significant effect on IB antibody titre levels. These results suggest that there may be no advantage in regular revaccination of birds for IB, provided that birds have been properly vaccinated during rearing. However, more information is required about the correlation between blood IB titre levels and protection against intercurrent IB infection before recommendations can be made to the Australian industry.

I. INTRODUCTION

Infectious Bronchitis (IB) is a contagious viral disease that affects the respiratory system, oviduct, and kidneys of chickens. The disease has the potential for serious economic impacts on layers where it may cause a reduction in the quantity and quality of egg production (Jordan, 1996). In Australia, at the present time, all the commercially available vaccines are live virus vaccines but in the future the availability of inactive vaccine viruses is a possibility (Cavanagh and Naqi, 1997). Clearly, vaccination programs will remain the cornerstone of the strategy for IB control, using a combination of live and inactivated vaccines targeted at the IB strains or variants active in a particular geographical area (Lister, 2001). Results from a previous experiment, using Webster’s VicS IB vaccine strain with ISA brown cockerels, indicated that vaccination at either day-old or two weeks of age, by eyedrop, coarse spray or water vaccination, protected birds against the effects of exposure to T strain IB virus (Sulaiman, Roberts, and Ball, 2001).

This experiment investigated the effect of strain of vaccine, route of vaccine administration and regular revaccination for IB, on production performance in laying hens

II. METHODS

Day-old ISA Brown hens (625) were purchased from the Winton Hatchery near Tamworth, NSW and transferred to isolation pens (geographically isolated in relation to natural wind directions) at the University of New England, Armidale, NSW. The birds were reared according to standard commercial practice. There were seven experimental groups,
each of 89 birds: Control (No vaccination), VicS eye (VicS vaccine by eye drop at day old), VicS spray (VicS by coarse spray at day old), VicS water (VicS in water at day old), A3 eye (A3 vaccine strain by eye drop at day old), A3 spray (A3 by coarse spray at day old), and A3 water (A3 in water at day old). Blood samples were taken from ten birds from each group at 4 weeks of age and birds were then revaccinated with the other strain of vaccine to that used at day-old, via the same routes as day old. The Control Group remained unvaccinated. Blood samples were taken from ten birds per group at 6 weeks of age. At 14 weeks of age, all birds (including the Control birds) were revaccinated with VicS vaccine strain by eye drop. At 15 weeks of age, all birds were transferred to two poultry isolation sheds equipped with 3-bird commercial-style cages. One-half of the birds from each treatment group were allocated to each shed, 2 birds per cage. The birds in one shed were revaccinated every 8 weeks with VicS vaccine strain by coarse spray, whereas the birds in the other shed were not revaccinated beyond 14 weeks of age. For each group, body weight (BW) was recorded regularly. Egg production, egg weight and the external appearance of the eggs were recorded daily. Faecal moisture was measured 1 and 2 weeks post revaccination. Every 4 weeks, 21 eggs of each group from each shed were collected for egg and egg shell quality measurements (a total of 294 eggs). Blood samples were taken from 5 birds from each group, in each shed, 3 weeks after revaccination for determination of the plasma electrolytes Na\(^+\), K\(^+\) and Ca\(^{++}\), haematocrit, and antibody titres (Birling Avian Laboratories: ProFLOK IBV ELISA kit). Clinical signs and mortality were recorded if observed and all mortalities autopsied.

Analysis of Variance was used to test the effect of vaccination treatment and regular revaccination on each measured parameter. Fisher's protected LSD was utilized to separate means when significant effects were observed. Statements of statistical significance were based on P<0.05 unless otherwise indicated.

III. RESULTS

**Body Weight**

There was no effect of vaccination treatment on the body weight of the birds. Body weights were within the target range recommended by the breeder company.

**Hen-day Production**

Hen-day production of non-revaccinated birds and revaccinated birds is shown in Figures 1 and 2. There was no significant effect of vaccination treatment on egg production between 18 and 40 weeks of age.

**Egg and Egg Shell Quality**

The effects of treatments and revaccination for IB on egg and egg shell quality measurements: shell deformation (µm), shell breaking strength (Newtons), shell reflectivity (%), egg weight (g), albumen height (mm), Haugh units (HU), yolk colour (Roche Scale), shell weight (g), percentage shell (%) and shell thickness (µm); were determined at 20, 24, 28, 32, 36 and 40 weeks of age. At 24 weeks of age (2 weeks post-vaccination), birds in the revaccinated group showed lower shell breaking strength, yolk colour, shell weight, percentage shell and shell thickness, as compared with birds which were not revaccinated. In addition, albumen height and Haugh units differed among treatment groups, being lowest for the A3 water group.
There were few significant effects of vaccination treatment on egg quality at 28 weeks (6 weeks postvaccination) with yolk colour being higher in the revaccinated birds and shell reflectivity lowest for the A3 groups. At 32 weeks of age (2 weeks postvaccination), birds in the revaccinated groups had lower shell breaking strength and percentage shell and higher egg weight and shell weight. At 36 weeks of age (6 weeks postvaccination), the revaccinated birds had lower shell breaking strength, percentage shell and shell thickness. There were also significant effects of treatment group on albumen height and Haugh Units with the A3 groups being lowest. At 40 weeks of age (2 weeks postvaccination), percentage shell was lower for the revaccinated birds. In addition, albumen height and Haugh Units were lowest for the A3 treatment groups.

**Faecal Moisture**

Faecal moisture was measured in samples collected over a 24 hour period, one and two weeks following re-vaccination. The control group, which had not been vaccinated prior to 14 weeks of age, tended (p= .0544) to have wetter faeces than the other groups at 16 weeks of age, two weeks following vaccination for the first time in that group (Table 1).

<table>
<thead>
<tr>
<th>Treatment Group</th>
<th>Control</th>
<th>VicS eye</th>
<th>VicS spray</th>
<th>VicS Water</th>
<th>A3 eye</th>
<th>A3 spray</th>
<th>A3 water</th>
</tr>
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<tbody>
<tr>
<td>Faecal Moisture %</td>
<td>74.7</td>
<td>67.4</td>
<td>68.2</td>
<td>71.5</td>
<td>70.6</td>
<td>67.8</td>
<td>71.1</td>
</tr>
</tbody>
</table>

**IB Titre Levels, Blood and Plasma Measurements**

Titre levels of non-revaccinated and revaccinated birds are shown in Figures 3 and 4. There was no significant effect of vaccination treatment on titre levels. However, titre levels varied with the age of bird, being greatest at 6-16 weeks of age.

There were no significant effects of vaccination treatment on blood and plasma measurements (haematocit and concentrations of Na, K, Ca⁺).
IV. DISCUSSION and CONCLUSIONS

The results of the present study indicate that vaccination treatment, including regular revaccination for IB does not affect body weight, egg production, faecal moisture, titre level, haematocrit or plasma concentrations of Na, K or Ca++. However, regular revaccination had some deleterious effects on egg shell quality. In addition, the groups of birds which had been vaccinated at day-old with A3 strain IB vaccine tended to have lower albumen height and Haugh Units. Although this study is on-going, results to date suggest that there is little advantage in regularly revaccinating laying hens for IB virus, provided that they have received appropriate vaccination during the rearing phase. However, more information is required about the correlation between blood IB titre levels and protection against intercurrent IB infection before recommendations can be made to the Australian industry.

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REFERENCES


