REGULAR REVACCINATION FOR INFECTIOUS BRONCHITIS VIRUS IN LAYING HENS: ADVANTAGES AND DISADVANTAGES

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

Summary

Different vaccination protocols for infectious bronchitis virus (IBV) were administered to ISA Brown laying hens during rearing and half the birds were revaccinated regularly during lay. At 57 wks of age, half of the birds were placed into an induced moulting (moulting prior to revaccination), all birds were then revaccinated for IB and the other half of the birds moulting (moulting following revaccination). Production and egg quality were lower in the birds that were revaccinated regularly during lay, especially from 18 to 56 weeks. IB antibody titres increased at 6 and 16 weeks, then decreased and remained relatively constant from 27 to 77 weeks, increasing markedly following exposure to T-strain IBV. Egg shell quality was better in the birds that were revaccinated prior to moult. There appears to be little advantage, and some disadvantage, of regular revaccination during lay, provided that the birds have been effectively vaccinated during rearing.

I. INTRODUCTION

In Australia, live infectious bronchitis virus (IBV) vaccines have been widely used since 1966 (Cumming, 1969). At the present time, the main effect of IBV on layer flocks are reduced production (“egg drop”) and reductions in egg quality (Chubb, 1987). Therefore, it is relevant to investigate the suitability of current vaccination protocols in protecting birds against challenge in the field. Some producers do not revaccinate for IBV once the birds have come into lay. However, increasingly, poultry veterinarians are recommending regular revaccination, usually every 8 weeks throughout lay.

Vaccination at 1-day-old with Vic S-strain IBV provided a limited degree of protection against a heterologous challenge with T-strain IBV at 15 d of age in broilers (Afanador & Roberts, 1994). In addition, a study using VicS IB vaccine strain with ISA Brown cockerels found 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 IBV (Sulaiman et al., 2001).

The objectives of this experiment were to determine the effect of regular revaccination for IB during lay (versus no revaccination during lay), and the timing of moult in relation to revaccination late in lay, on production performance in laying hens. In addition, the effect on IBV antibody titres and kidney histology, of exposure to T-strain IBV at the end of lay, was assessed.

II. MATERIALS AND METHODS

Day-old ISA Brown hens (625) were purchased from the Winton Hatchery near Tamworth, NSW and transferred to isolation pens at the University of New England, Armidale, NSW. There were seven experimental groups, each of 89 birds, based on the vaccine strain at day-old and the route of vaccine administration: Control (No vaccination), VicS eye, VicS spray, VicS water, A3 eye, A3 spray, A3 water. Birds were revaccinated at 4
weeks with the opposite strain of vaccine, via the same routes as day old. The Control Group remained unvaccinated until 14 weeks of age when all birds were vaccinated by VicS via eyedrop. Blood samples were taken from the same ten birds from each group (a total of 70 birds) at 4, 6, 16, 27, 35, 43, 49, 58, 65, 77, 79 and 80 weeks of age. Half of the birds were revaccinated every 8 weeks (from 14 weeks) with VicS vaccine strain by coarse spray whereas the remaining birds (in a separate shed) were not revaccinated beyond 14 weeks of age.

At 57 weeks of age, birds from all treatment groups were moved to individual cages for revaccination either before or after an induced moulting. Half of the birds were moulting at 57 weeks, all birds were revaccinated at 62 weeks of age by coarse spray with VicS IBV and the other half of the birds were then moulting.

Egg production, egg weight and the external appearance of the eggs were recorded daily from the start of lay until the end of the experiment (80 weeks). Faecal moisture was measured 1 and 2 weeks post revaccination. Every 4 weeks, eggs were collected for egg and egg shell quality measurements (egg weight, shell reflectivity, shell breaking strength, deformation, shell weight, shell thickness, percentage shell, albumen height, Haugh Units, yolk colour score).

At 77 wks of age, birds were exposed to T strain IBV by eyedrop of 1 bird in 5. The challenge virus was purchased from Dr. Jagoda Ignjatovic of the CSIRO Australian Animal Health Laboratory, Geelong. Serum samples and kidneys were collected 1-2 wks before and 1, 2, 3, 4, and 5 wks after the challenge. Body weight and kidney weight were recorded. Histological sections were prepared from the left cranial division of each kidney and stained with haematoxylin and eosin prior to viewing under a light microscope. Any signs of abnormality in the kidney tissue were recorded.

Analysis of Variance was used to test the effect of treatment 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.

III. RESULTS

There was a significant effect of hen age (P<0.01) on egg production from 18 to 56 wks of age, with production increasing to a peak of 94.5 eggs/100 hens/day at 29 weeks and then decreasing gradually to 83.8 eggs/100 hens/day at 56 wks of age. There was a small but statistically significant effect (P<0.01) of regular revaccination on egg production between 18 and 56 weeks of age, with production during this period being higher for the birds that were not revaccinated regularly (Table 1).

There was a significant effect on hen-day production of regular revaccination from 57 to 73 weeks of age (including the moult period). The birds that had been revaccinated regularly for IBV during lay had slightly lower production at 57-73 weeks (57.9 eggs/hen/100 days) than the birds that had not been revaccinated (59.2 eggs/hen/100 days). For birds that had been revaccinated regularly during lay, production was higher when moult was induced after revaccination at 62 weeks, whereas for birds not revaccinated regularly, production was higher when moult preceded revaccination. However, there was no significant main effect of timing of moult on overall hen-day production.

There were effects of regular revaccination on egg quality from 18 to 56 wks of age (Table 1). Egg weight was higher and shell breaking strength, percentage shell, shell thickness were lower in the birds that were revaccinated regularly during lay. However, when the collections taken at 72 and 78 weeks of age were considered together, there were no statistically significant differences between the birds that were revaccinated regularly during lay and those that were not. Although shell breaking strength, shell weight, percentage shell
and shell thickness were all higher at 78 wks than at 72 wks, there was a statistically significant interaction between age and vaccination treatment only for shell breaking strength which, at 78 wks, was higher for the birds that were not revaccinated regularly during lay.

Table 1. Effect of regular revaccination on production and egg quality at 18-56 weeks (eggs/100 hens/day)

<table>
<thead>
<tr>
<th>Egg and Egg Shell Quality</th>
<th>Revaccinated Regularly</th>
<th>Not revaccinated during lay</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hen-day production (%)</td>
<td>86.6 ± 0.4</td>
<td>^88.1 ± 0.4</td>
</tr>
<tr>
<td>Egg weight (g)</td>
<td>60.4 ± 0.2</td>
<td>59.4 ± 0.2</td>
</tr>
<tr>
<td>Shell reflectivity (%)</td>
<td>33.4 ± 0.1</td>
<td>33.4 ± 0.1</td>
</tr>
<tr>
<td>Shell breaking strength (Newtons)</td>
<td>41.2 ± 0.2</td>
<td>^42.5 ± 0.2</td>
</tr>
<tr>
<td>Shell deformation (µm)</td>
<td>270.5 ± 2.2</td>
<td>266.2 ± 2.0</td>
</tr>
<tr>
<td>Shell weight (g)</td>
<td>6.01 ± 0.02</td>
<td>6.03 ± 0.02</td>
</tr>
<tr>
<td>Percentage shell (%)</td>
<td>9.98 ± 0.02</td>
<td>^10.18 ± 0.03</td>
</tr>
<tr>
<td>Shell thickness (µm)</td>
<td>430.4 ± 0.9</td>
<td>^435.3 ± 0.9</td>
</tr>
<tr>
<td>Albumen height (mm)</td>
<td>7.34 ± 0.04</td>
<td>7.38 ± 0.03</td>
</tr>
<tr>
<td>Haugh Unit</td>
<td>84.5 ± 0.3</td>
<td>85.2 ± 0.2</td>
</tr>
<tr>
<td>Yolk colour score (Roche Scale)</td>
<td>11.24 ± 0.03</td>
<td>11.22 ± 0.03</td>
</tr>
</tbody>
</table>

Values are Mean ± S.E. Within a row, values with different superscripts are significantly different from each other.

There was no significant difference in excreta moisture or IBV antibody titre levels between birds that were revaccinated regularly during lay and those that were not. However, titres were significantly higher for all treatment groups at 6-16 weeks of age than at any other age up to 77 weeks.

Following exposure to T-strain IBV, IBV antibody titres increased markedly in all treatment groups at 79 and 80 weeks. Figure 1 shows the IBV titres of all initial vaccination treatment groups in birds, separated into those that were revaccinated regularly during lay and those that were not. There was no significant effect of exposure to T strain IBV on body weight, or total kidney, right kidney and left kidney weights expressed as a percentage of body weight, irrespective of vaccination protocol.

Haematocrit value and the plasma concentrations of sodium, potassium and calcium were not significantly affected by regular revaccination. Histological sections of kidney showed that most kidneys were normal with only a small number of kidneys showing signs of mononuclear cell infiltration. In addition, this incidence was no higher following challenge with T-strain IBV than it had been prior to challenge.
Figure 1. IBV antibody titres of initial vaccination treatment groups for birds that were not revaccinated regularly during lay (left) or revaccinated every eight weeks during lay (right). Arrows indicate vaccination, the solid arrows indicate the time of challenge.

IV. DISCUSSION AND CONCLUSIONS

Regular revaccination during lay resulted in a small reduction in production throughout the laying life of the flock and had some deleterious effects on shell quality, particularly in the early to peak lay period. IBV antibody titres remained relatively low in all groups from 27 to 77 weeks of age, in spite of revaccination, although titres increased markedly following exposure to T-strain IBV. These results may indicate that, immunologically, there is no benefit in revaccinating throughout lay, as there is limited ongoing upregulation of the immune response in these layers. It appears that there is little advantage, and some disadvantage, in revaccinating laying hens regularly during lay, if they have been effectively vaccinated during rearing. A complete vaccination/challenge study may be required to accurately relate the antibody titres seen to infection following challenge.

V. ACKNOWLEDGEMENTS

The support of Australian Egg Corporation Limited for this study is gratefully acknowledged. We thank Dr. Roger Chubb for helpful discussions.

REFERENCES