Use of Heterologous Live IBV Vaccines in Day-old Commercial Broiler Chick Enhances The Protection against Middle East Variant Infectious Bronchitis Viruses

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Introduction

- IBV IS/885/00 and IS/1494/06, or those with high similarities to these strains, have been reported throughout the Middle East and North.
- In most cases, severe respiratory distress and renal lesions with high mortality were observed in flocks affected by these strains.
- It appears that conventional vaccines alone do not provide sufficient protection against these strains.
- Use of different combinations of live IBV vaccines has been shown to induce high and broad protection against challenges with several heterologous virulent IBV variants.

- The objective of this study was to evaluate the protection conferred by available live IBV vaccines when used in strategic manner against the two prominent Middle East variant IBVs that are related to IS/885/00 and IS/1494/06 (Variant 2).
Materials and Methods

- Day-old commercial broiler chicks with IBV MDA
- Two commercial live IBV vaccines (H120 and CR88)
- Virulent IBVs (IS/885/00 and IS/1494/06-like)
- ELISA and HI

<table>
<thead>
<tr>
<th>Groups</th>
<th>n</th>
<th>Vaccine type and age of vaccination</th>
<th>Volume inoculated and route of vaccination</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>30</td>
<td>1 day of age, H120</td>
<td>100 μl, Oculonasally</td>
</tr>
<tr>
<td>II</td>
<td>30</td>
<td>14 days of age, H120+CR88</td>
<td>100 μl, Oculonasally</td>
</tr>
<tr>
<td>III</td>
<td>30</td>
<td>14 days of age, none</td>
<td>100 μl, Oculonasally</td>
</tr>
</tbody>
</table>

- At 30 days of age (day of challenge), from each group, blood samples collected from 10 birds for serology
  & 10 birds from each group were challenged with IS/885/00-like or IS/1494/06-like
- Ten birds from each group were challenged with IS/885/00 ($10^{4.66}$CD50/bird).
- After 5 days post challenge (dpc)
  - Trachea: For ciliostasis examination
  - Kidney and trachea: Lesion scoring.
Results: Serology

Mean ELISA antibody titres at 30 days of age. Group I = d0:H120, d14:CR88; group II = d0:H120+CR88, d14CR88; group III = control. Bars represent the mean ± SEM for eight birds each group. Different superscripts lowercases letters in the bar indicate significant difference (P<0.05), while data with same letters indicates that there were no significant differences (p > 0.05). The cut-off titre = 834.

HI antibody titres log₂ against IBV antigens at 30 days of age. Group I = d0:H120, d14:CR88; group II = d0:H120+CR88, d14CR88; group III = control. Bars represent the mean ± SEM for eight birds each group. Different superscripts lowercases letters in the bar indicate significant difference (P<0.05), while data with same letters indicates that there were no significant differences (p > 0.05) (within same antigen). The cut-off titre = 3log₂.
### Results: Ciliostasis test and gross lesions

<table>
<thead>
<tr>
<th>Group</th>
<th>IS/885/00-like</th>
<th>IS/1494/06-like</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ciliostasis test</td>
<td>Gross lesions*</td>
</tr>
<tr>
<td></td>
<td>Protection score</td>
<td>Trachea</td>
</tr>
<tr>
<td>I</td>
<td>60</td>
<td>0 (0/1)\textsuperscript{a}</td>
</tr>
<tr>
<td>II</td>
<td>83</td>
<td>0 (0/0)\textsuperscript{a}</td>
</tr>
<tr>
<td>III</td>
<td>0</td>
<td>1 (0/2)\textsuperscript{b}</td>
</tr>
</tbody>
</table>

Protection score = 1 - the mean score for vaccinated and challenged group/mean score for challenge control group ×100; the higher the score, the better the protection. \* Severity of gross lesions induced by virulent IBV infection and data are expressed as the median (minimum/maximum) (Number of samples = 10 per group). Different superscripts lowercases letters within same columns indicate significant difference (P<0.05), while data with same letters indicates that there were no significant differences (p > 0.05).
The combined vaccination programme where chicks were vaccinated with both live H120+CR88 vaccines (Group II) at day-old and with live CR88 at 14 days-old, provided excellent protection against both isolates.

Group 1, which had live H120 vaccine alone at day old followed by CR88 vaccine two weeks later, showed 60% and 80% protection against IS/885/00 and IS/1494/06-like respectively.

The vaccination programme of group II (83%) has further boosted the ciliary and tracheal/kidney protection against IS/885 compared to that of group I (60%).

Both vaccination programmes provided excellent protection (80%-94%) against the virulent IS/1494 challenge

In conclusion, it appears that a combination of live H120+CR88 vaccines given at day old followed by CR88 vaccine at day 14 of age confer excellent protection against virulent variant IS/885 and IS/1494 viruses.

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