INTERACTIONS BETWEEN LIVE NEWCASTLE DISEASE, AVIAN METAPNEUMOVIRUS AND INFECTIOUS BRONCHITIS VACCINE VIRUSES IN SPECIFIC-PATHOGEN-FREE CHICKS

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SUMMARY

Interactions between live avian metapneumovirus (aMPV), Newcastle disease virus (NDV) and infectious bronchitis virus (IBV) vaccines following simultaneous vaccination of one day old specific pathogens free chicks were evaluated. Chicks were divided into eight groups. One group served as unvaccinated control. Other seven groups were vaccinated against NDV, aMPV or/and IBV (single, dual, and triple). At intervals, oropharyngeal (OP) swabs, blood and tissues were collected for virus detection by reverse transcriptase polymerase chain reaction (RT-PCR). At 21 day post vaccination (dpv), birds were bled and 10 chicks from each group were challenged with virulent IBV or aMPV. Findings from this study showed that based on the absence of clinical signs following vaccinations and protection conferred against IBV M41 and virulent aMPV subtype B, it appears that these vaccines can be applied simultaneously. The study also demonstrated that chicks that had not received aMPV vaccination showed substantial clinical signs when challenged at 3 weeks old.

INTRODUCTION

Newcastle disease (NDV), avian metapneumovirus (aMPV) and infectious bronchitis (IBV) viruses are important and common causes of respiratory diseases in chicken. The losses due to these pathogens are reduced with the use of live and inactivated vaccines worldwide including use of combined live vaccines against aMPV, IBV and NDV. It is well known that these viruses are initially replicate in the epithelium of respiratory tract and it was presumed this may reduce their ability to induce protective immunity when all three live vaccines are applied simultaneously. It has been reported that NDV and IBV may delay the replication of aMPV vaccine (Cook et al., 2001, Ganapathy et al., 2005). The aim of this study is to examine the interactions between live aMPV, NDV and IBV vaccines in SPF chicks. Clinical respiratory reactions, tissue distribution of the viruses, immune responses, pathology and protections against challenge viruses were examined.

MATERIALS AND METHODS

One-day-old specific pathogen free chicks were allocated into eight groups (Table 1). The control (C) group was sham inoculated with sterile water (SW). Each chick was inoculated by ocular (50 µl) and orally (50 µl) routes. Through the same route of application, using the same volume for inoculation, different groups of chicks were
vaccinated singly, dually or triply (Table 1). Dosages received by each bird were as recommended by the manufacturers.

**Table 1.** Chicks were randomly divided into 8 groups and immunized against NDV, aMPV and/or IBV.

<table>
<thead>
<tr>
<th>Groups/vaccines</th>
<th>Number of birds</th>
<th>Oculo-oral dose</th>
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<tbody>
<tr>
<td>NDV</td>
<td>40</td>
<td>5.5 log&lt;sub&gt;10&lt;/sub&gt; EID&lt;sub&gt;50&lt;/sub&gt;/chick</td>
</tr>
<tr>
<td>aMPV</td>
<td>40</td>
<td>5.0 log&lt;sub&gt;10&lt;/sub&gt; EID&lt;sub&gt;50&lt;/sub&gt;/chick</td>
</tr>
<tr>
<td>IBV</td>
<td>40</td>
<td>2.3 log&lt;sub&gt;10&lt;/sub&gt; TCID&lt;sub&gt;50&lt;/sub&gt;/chick</td>
</tr>
<tr>
<td>NDV+aMPV</td>
<td>40</td>
<td>as above</td>
</tr>
<tr>
<td>NDV+IBV</td>
<td>40</td>
<td>as above</td>
</tr>
<tr>
<td>aMPV+IBV</td>
<td>40</td>
<td>as above</td>
</tr>
<tr>
<td>NDV+aMPV+ IBV</td>
<td>40</td>
<td>as above</td>
</tr>
<tr>
<td>Unvaccinated control</td>
<td>40</td>
<td>Sterile water</td>
</tr>
</tbody>
</table>

At intervals, oropharyngeal and blood samples were collected for virus RT-PCRs and serology respectively. At 21 dpv, 10 birds for each group were transferred to other isolation room and challenged with virulent aMPV subtype B, each bird received 0.1 ml by oculo-nasal route. Also another 10 birds from each group were challenged with of virulent IBV M41; each bird received 0.1 ml via the ocular-nasal routes. Post-challenge OP swabs and blood samples were collected. Following aMPV challenge, birds were visited once a day for 13 days post-challenge to record the clinical signs, each bird was examined (squeezing) individually and clinical signs were recorded as before (Jones et al., 1992). For IBV challenge, 5 birds from each unchallenged and challenged groups respectively were examined for ciliary scores. Scoring of the cilia beating was recorded as described by before (Cook et al., 1999). Samples of OP swabs from each group at each sampling interval were pooled and subjected to detection of the viruses. For aMPV, IBV and NDV, RT-PCRs were carried out as described before (Cavanagh et al., 1999, Aldous and Alexander, 2001).

**RESULT**

Following vaccination, no clinical signs were observed in vaccinated or unvaccinated groups. As for detection of vaccine viruses by RT-PCR, for NDV, it was detected in all NDV-vaccinated groups at 3 dpv and again at 7 dpv, but only in the group given all three live vaccines. For aMPV, it was detected in single aMPV-vaccinated group up to 7 dpv but remained detected up to 21 dpv when it was given along IBV, either dually or as triple vaccination. IBV was detected throughout the experimental duration either given alone or with other live vaccines. Serology is in progress.

In aMPV-vaccinated-challenged, either the aMPV vaccine was given singly, dually or triply, no clinical signs were observed. In contrast, those groups that did not receive any aMPV vaccine showed substantial clinical signs. Following, IBV challenge, almost 100% ciliary protection were found against virulent M41 and QX viruses.
DISCUSSION

This study demonstrated that in SPF chicks, aMPV, IBV and NDV vaccines can be administered concurrently. There was no post vaccination reaction observed throughout the experimental duration. All aMPV-vaccinated groups were clinically protected against virulent aMPV challenge. Ciliary scores showed that chickens that had received IBV H120 vaccine alone or in combination with NDV or aMPV were fully protected against IBV M41. It appears that simultaneous vaccination with live aMPV (subtype B), NDV (VG/GA strain) and IBV (H120) did not affect the protection conferred against IBV or aMPV.

In term of vaccine virus detection, aMPV was detected at much longer (up to 21 dpv) duration when administered with IBV or in combination with IBV and NDV. Prolonged detection of aMPV in dual vaccination with NDV has been reported before (Ganapathy et al., 2005). Similarly NDV was detected up to 7 d (Jones et al., 1992)pv only in the group that received all 3 live vaccines. Despite these detections, there were no clinical signs observed in any of the groups reflecting mild infectious nature of the live vaccine but still induced excellent protection against IBV and aMPV. No NDV challenge was done but previous studies (Ganapathy et al., 2007) have shown that chicks with HI titre of log 4 and above were protected against virulent NDV challenge.

REFERENCES


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