IMMUNOSUPPRESSIVE EFFECTS OF AN INFECTIOUS
BURSAL DISEASE - IMMUNE COMPLEX VACCINE
IN BROILERS

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(Received : 06-01-2006; Accepted : 28-02-2006)

Information on the virulence and
immunosuppressive effects of an IBDV-Icx
vaccine in broilers based on HI serum
antibody and its protective effect against
challenge with a virulent Newcastle disease
virus strain.

Materials and Methods

Vaccine and Challenge viruses:
In this study, an IBDV-Icx vaccine
(Transmune, CEVA, France), and three live
Newcastle virus strains including
entrotopic apathogenic Phy. LMV.42 strain
(Vitapest, CEVA, France), BI and LaSota
(Serum and Vaccine Razi Institute, Iran)
were used. A virulent strain of NDV,
HERTZ33, was also used for the challenge
(Saif et al., 2003).

Experimental design: Three
hundred embryonated eggs (Ross 308)
were provided from a 30-weeks old broiler
breeder flock that had high maternal
antibody against IBD, and incubated in a
modern hatchery. At embryonation day
(ED) 18 in the hatchery, 120 embryonated
eggs were injected with the IBDV-Icx
vaccine through the eggshell. A
commercial automated egg injection
system, the INOVOJECT® (EMBREX, US),
was used to inoculate the eggs. After hatch
the per cent of hatchability among
vaccinated and non vaccinated chicks was
recorded. All 300 day-old chicks were
transferred to the faculty of veterinary
medicine, weighed, divided into 5 groups
of 60 birds, settled in separated rooms, and
kept under identical conditions. The birds
were observed for any mortality and
disease symptoms and were provided feed
and water ad libitum. Groups 1 and 2 were
consisted of chicks, which had received the
in ovo vaccine at ED 18. Chicks in group 3
received IBDV-Icx vaccine at day 1
subcutaneously. Chicks in group 1 received
entrotopic apathogenic NDV strain (eye
drop at day 1 of age and chicks in groups
2,3 and 4 received B1 (eye drop at day 7)
and LaSota NDV strain (in drinking water
day 18 of age). Birds in group 5 did not
receive any vaccine and served as
controls. At 31 days of age, 50 randomly
selected birds from each group were
challenged with the virulent NDV HERTZ33
strain. Each bird received a dose of 10⁸
ELD₅₀ viruses via intramuscular (IM) route.
All birds in different groups were kept under
tight control for 14 days post-challenge
(PC) and were monitored for the
observation of the clinical signs (especially
nervous signs), mortality and development
of typical lesions of ND among dead birds.
At 14 days PC (45 days of age), all birds
were euthanized and necropsied for gross
lesion observations. At days 1,7,14,21, 28
(prior to challenge), 38, and 45 of age (after
challenge), 20 birds from each group were weighed and bled. Serum samples were prepared to determine the serum HI antibody titre to the NDV (Mazariegos et al., 1990)

**Statistical analysis**: Average weight gains and serum HI antibody titre among birds in 5 groups present in this study were compared using one-way ANOVA and Tukey's test (P ≤ 0.05) by SPSS program (Version 11.0). For differences in mortality between each two treatment groups, data were subjected to chi-square analysis.

### Results and Discussion

This study demonstrated that *in ovo* or day-old immunization of broiler chicks against IBD with an infectious bursal disease-immune complex vaccine does not have any significant immunosuppressive effects on broilers. Prior to challenge, the comparison of the mean NDV-HI titres among groups revealed that in the most cases there were no significant differences among groups that received both IBD and NDV vaccines or NDV vaccine alone (Table 1). After challenge, there were increases in the mean titres of all vaccinated groups. The geometric mean of the NDV-HI titres of birds in 5 groups did not differed significantly from each other at 1 and 7 days of age. In group 1, the geometric mean of the HI titres of birds was significantly higher than those of birds in other groups at 14 days of age. The mean titres for non-vaccinated birds (group 5) were significantly lower than those of vaccinated birds in groups 1-4 at 21 and 28 days of age (there were no live birds in group 5 at 38 and 45 days of age to make such comparison). Two *in ovo*-vaccinated groups (1 and 2) were differed significantly at days 14, 21, 38 and 45 days of age. The mean titres of group 1, which received the entrotropic apathogenic NDV strain, were significantly lower than those of groups 2 and 4. Whether this difference may be an indication of a lower efficacy of a single dose vaccination by the entrotropic apathogenic NDV vaccine strain needs to be elucidated. The mean titres of birds in groups 2, 3 and 4 were not significantly different from each other at weekly intervals till the end of the experiment. All birds in unvaccinated group (5) died 14 days PC.

The frequency of mortality was significantly higher in unvaccinated group that was an indication of values of vaccination program against NDV challenge (Table 2). High frequency of deaths occurs in non-immunized birds after challenge with a virulent strain of NDV (Saif et al., 2003). There were no significant differences in mortality rate among groups vaccinated by IBDV-Icx vaccine. Birds in group 4, however, which were immunized by NDV vaccines only, suffered the lower mortality when compared with birds in groups received IBD vaccine prior to ND vaccination, although the difference was not significant. This finding may reflect slightly immunosuppressive effect of IBD vaccine strain used in this study. No significant differences were recorded for weight gains among surviving birds in different groups at the end of experiment.

Susceptibility to a variety of bacterial, protozoal and viral diseases of chickens may be enhanced in chicks infected with IBDV early in life. The immunosuppressive effects of IBDV infection on the antibody response to vaccines have been reported previously (Saif, 1991). Suppression of
Table 1: Mean serum HI antibody titre of birds in treatment groups

<table>
<thead>
<tr>
<th>Group</th>
<th>1</th>
<th>7</th>
<th>14</th>
<th>21</th>
<th>28</th>
<th>38</th>
<th>45</th>
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<td>4.9&lt;sup&gt;a&lt;/sup&gt;</td>
<td>4.6&lt;sup&gt;a&lt;/sup&gt;</td>
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<tr>
<td>2</td>
<td>6.75&lt;sup&gt;a&lt;/sup&gt;</td>
<td>5.2&lt;sup&gt;a&lt;/sup&gt;</td>
<td>4&lt;sup&gt;b&lt;/sup&gt;</td>
<td>3.8&lt;sup&gt;b&lt;/sup&gt;</td>
<td>4.2&lt;sup&gt;a&lt;/sup&gt;</td>
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<td>9.5&lt;sup&gt;b&lt;/sup&gt;</td>
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<td>4.1&lt;sup&gt;b&lt;/sup&gt;</td>
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<td>4.2&lt;sup&gt;a&lt;/sup&gt;</td>
<td>6.9&lt;sup&gt;b&lt;/sup&gt;</td>
<td>8.3&lt;sup&gt;ab&lt;/sup&gt;</td>
</tr>
<tr>
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<td>5.25&lt;sup&gt;a&lt;/sup&gt;</td>
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<td>2.5&lt;sup&gt;c&lt;/sup&gt;</td>
<td>1.4&lt;sup&gt;b&lt;/sup&gt;</td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>

1 Means with different superscripts within the same column differ significantly (P ≤ 0.05).
2 Vaccination schedule of each group (60) was as follows: Group 1 = IBDV-Icx (in ovo) + entrotropic apathogenic NDV strain, Group 2 = IBDV-Icx (in ovo) + B1 + LaSota, Group 3 = IBDV-Icx (SC) + B1 + LaSota, Group 4 = B1 + LaSota, Group 5 = No vaccination. Chickens (50) were challenged at 31 days of age with a virulent NDV strain.

Table 2: Rate of bird mortalities in treatment groups

<table>
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<th>3</th>
<th>6</th>
<th>9</th>
<th>12</th>
<th>14</th>
<th>Total</th>
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<td>0&lt;sup&gt;a&lt;/sup&gt;</td>
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<td>50&lt;sup&gt;b&lt;/sup&gt;</td>
<td>50&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

1 Means with different superscripts within the same column differ significantly (P ≤ 0.05).

Response to Newcastle disease virus vaccines has been commonly used to study the immunosuppressive effects of IBD vaccines. The strain of the IBDV vaccine virus plays an important role in its immunosuppressive ability (Mazariegos et al., 1990). Less virulent IBDV strains were shown not to be immunosuppressive, whereas, the more virulent strains induced immunosuppression (Giambrone and Clay, 1986). These researchers studied two intermediate vaccines and showed that they produced slightly atrophic bursae with moderate microscopic lesions but did not demonstrate immunosuppression. They concluded that the severe bursal lesions i.e. high atrophic bursal and severe microscopic bursal lesions are required to induce immunosuppression.

The lower level of HI titre afforded by ND vaccination after exposure to IBD vaccine has been reported previously (Mazariegos et al., loc. cit; Kelemen et al., 2000) was not comparable to the findings of this investigation. Except in one group, this study showed no significant difference in HI titre is induced by ND vaccination between groups vaccinated or not vaccinated with IBD previously. The group that received the entrotropic apathogenic NDV vaccine strain (with prior exposure to
IBD vaccine) demonstrated a significantly lower HI titre compare to the group, which received B1 and LaSota NDV vaccine strains. The difference, however, may not be related to effects of IBD vaccination.

**Summary**

This study was conducted to test the immunosuppressive effects of an infectious bursal disease virus (IBDV) vaccine administered *in ovo* or to day-old chicks. The IBD vaccinated groups (*in ovo* or day 1) were immunized against Newcastle Disease (ND) with an entroptropic apathogenic (at day 1) or B1 (day 7) and LaSota (day 18) strains. One group received only B1 and Lasota vaccine strains and one group, as control, did not receive any vaccine. At 31 days of age, birds in all groups were challenged with a virulent ND virus strain (HERTZ33). Prior to and after challenge, birds were bled at weekly intervals for antibody detection. This study demonstrated that *in ovo* or day-old immunization of broiler chicks against IBD with an infectious bursal disease-immune complex vaccine did not have any significant immunosuppressive effects on broilers.

**Acknowledgement**

This research was supported by the Research Council of University of Tehran.

**REFERENCES**


