Effect of hyperimmunized egg yolk on maternal immunity of Newcastle disease vaccine in broiler chicks

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Abstract

Hyperimmunized egg yolk (HIY) was produced in two layer hens by four successive immunization with live attenuated Newcastle disease vaccine (NDV) by seven days intervals for each vaccination process. Fifty broiler chicks were used for treatment with hyperimmunized yolk. They were divided into five groups. The first group was treated at 14th days of age by orally and intramuscular injection (five chicken for each route). The second group was boostered with (HIY) after 7 days of first dose at14 days of age. The third group as that of the first group but treated at 21st day of age. The fourth group was treated at 21st days and boostered after 7 days. The fifth group was ten chicks remain without any treatment used as control comparison of all groups. Immune response was measured using HI technique. The results showed that the group of 14th day of age with booster dose gave high antibody titer by intramuscular injection (second group).

Keywords: Newcastle disease; Hyperimmunized yolk; Broiler; HI test; maternal immunity.
transferred from the egg yolk to the offspring via the embryonic circulation (4,6-8). This type of immunoglobulin is act as passive immunity because these antibodies are derived from the dam and protect the offspring from various infectious disease (9). Chicken can provide a convenient and economic source of immunoglobulin in their egg yolk, the efficiency of egg yolk immunoglobulin (IgY) has been assessed for therapeutic application by passive immunization therapy for prevention or control of different infections (10) Many reports were studied the prophylactic effect of egg yolk IgY and its success in the prevention of different pathogens as Helicobacter pylori (11), enterotoxigentic, E. Coli, Streptococcus mutans, Salmonellosis, Campylobacterosis, mixed bacterial infections, Staphylococcus with Pseudomonas and viral diseases as Infectious bursal disease, Newcastle disease, Rota virus, (12-16).

This paper describes the production of hyperimmunized egg yolk (HIY) in layer chicken and the purification of egg yolk in order to study its effect on maternal derived antibody titers of NDV.

Materials and methods

Production of hyperimmunized yolk

Two layer chickens (22) weeks old were vaccinated with one vaccinal lasota strain of NDV (Lohmann company) dose of (10^7 EID_{50}/0.1ml) orally for four times with seven days interval between each vaccination.

Collection of egg samples

Eggs were collected once before ND vaccination and other four groups of eggs were collected after one week after each immunization then were stored at 4°C until further use.

Separation of egg yolk

Egg yolk was taken out of the egg shell, placed in a sterile container and mixed with the same volume of sterile phosphate buffer saline (PBS) with shaking. The emulsion was centrifuged at 1500 rpm/ 20min. The mixture was separated into 2 layers, the clear supernatant fluid containing the IgY was collected and stored at -20°C until analysis (17,18).

Experimental chicks

Fifty-one-day- broiler chicks were housed in animal house of veterinary medicine college and kept for ad libitum containing no antibiotics. All birds were not vaccinated,ten were chicks used as control group without any treatment and 40 chicks were divided into four groups

First group: Ten chicks on 14th days old were given 1ml of IgY containing fluid, by oral and I/M injection routes as a single dose, five chicks for each route of administration).

Second group: Ten chicks on 14th days old were given 1ml of IgY containing fluid followed by booster dose after one week at the routes and number of birds.

Third group: Ten chicks on 21st days old were divided into two subgroups 5 chick were given IgY containing fluid 1ml by oral and I/M injection as single dose.

Fourth group: Ten chicks on 21st days old were given 1 ml of IgY containing fluid with booster dose after one week from the first dose by oral and I/M routes (5birds for each route).

Fifth group: Ten chicks remain without any treatment and regarded as negative control.

Collection of serum samples

Blood samples were collected from all experimental groups by heart puncture then sera were separated by centrifugation at 2000rpm for ten minutes and were stored at -20°C until further use.

HI test

Antibody titer against Newcastle disease virus (NDV) in serum and yolk was determined by (HI) technique depending on (4HA) units (17).

Statistical analysis

Data of all experiments were expressed as mean ± SE data were compared by one way and tow way analysis of variance. Significant difference determined by holm-sidak and Duncan's multiple range test. All statistical analysis performed by sigma stat (Jandel scientific software v3.1) (P<0.05) was considered as statistically significant.

Results

Newcastle disease antibody titres in laying hens

The results of the present study revealed that the antibody titre of hyperimmunized yolk were different significantly (P<0.05) in the collected eggs. The higher HI titer against NDV was 4.625 when layer chickens were vaccinated with live attenuated Newcastle disease vaccine with three booster doses, (Table 1).

Newcastle disease antibody titre in broiler chicks

The serum antibody titres of control group (fifth group) show the high maternal derived antibody titer through the two weeks only (5.250, 4.375, 3.625) then decline gradually to reach 0.833 at five weeks of age, (Table 2).
Table (1): Mean± SE of HI titre in egg yolk after successive NDV vaccination of layer hens.

<table>
<thead>
<tr>
<th>Numbers of vaccination to layer chickens</th>
<th>No. of examined eggs</th>
<th>Mean ± SE HI titre of egg yolk</th>
</tr>
</thead>
<tbody>
<tr>
<td>One vaccine only</td>
<td>5</td>
<td>2.800 ± 0.200 A*</td>
</tr>
<tr>
<td>vaccine + one booster dose</td>
<td>8</td>
<td>3.00 ± 0.267 A</td>
</tr>
<tr>
<td>vaccine + two booster doses</td>
<td>8</td>
<td>4.125 ± 0.295 B</td>
</tr>
<tr>
<td>vaccine + three booster doses</td>
<td>8</td>
<td>4.625 ± 0.183 B</td>
</tr>
<tr>
<td>Control</td>
<td>8</td>
<td>2.375 ± 0.263 A</td>
</tr>
</tbody>
</table>

*A-B values within a column following by different letters are significantly different (P<0.05).

Table 2: Mean± SE HI maternal antibody titres of control group (fifth group) chicks.

<table>
<thead>
<tr>
<th>Age of birds</th>
<th>Mean ± SE HI serum titre</th>
</tr>
</thead>
<tbody>
<tr>
<td>One Day</td>
<td>5.250 ± 1.282 a*</td>
</tr>
<tr>
<td>7 Days</td>
<td>4.375 ± 0.744 ab</td>
</tr>
<tr>
<td>14 Days</td>
<td>3.625 ± 1.88 bc</td>
</tr>
<tr>
<td>21 Days</td>
<td>3.00 ± 0.926 cd</td>
</tr>
<tr>
<td>28 Days</td>
<td>2.2 ± 0.447 de</td>
</tr>
<tr>
<td>35 Days</td>
<td>0.833 ± 0.753 e</td>
</tr>
</tbody>
</table>

*Differences in the column revealed significant differentces (P<0.05).

Discussion

The results of antibody titres of experimentally treated chicks with hyperimmunized yolk show significantly higher antibody titres with I/M injection compared with those treated with oral route in all groups. The higher titre was 5.8 recorded in the second group (chicks treated in two weeks with booster dose) and also give higher antibody titres of 4.4 by oral route. These titres were higher than those reported in the remaining groups (3 and 4) and in both oral and I/M injection routes (Table 3).

Table 3: Mean ± SE serum antibody titres of treated chicks with IgY containing fluid in different groups.

<table>
<thead>
<tr>
<th>Type of group</th>
<th>Oral</th>
<th>I/M injection</th>
<th>Fifth group (control)</th>
</tr>
</thead>
<tbody>
<tr>
<td>First</td>
<td>3.8 ± A*</td>
<td>4.60 ± A</td>
<td>3.625 ± A</td>
</tr>
<tr>
<td></td>
<td>0.270 a**</td>
<td>0.270 b</td>
<td>1.88 a</td>
</tr>
<tr>
<td>Second</td>
<td>4.4 ± A</td>
<td>5.8 ± B</td>
<td>3.00 ± A</td>
</tr>
<tr>
<td></td>
<td>0.270 a</td>
<td>0.270 b</td>
<td>0.926 c</td>
</tr>
<tr>
<td>Third</td>
<td>2.2 ± B</td>
<td>3.8 ± C</td>
<td>3.00 ± A</td>
</tr>
<tr>
<td></td>
<td>0.270 a</td>
<td>0.270 b</td>
<td>0.926 b</td>
</tr>
<tr>
<td>Fourth</td>
<td>1.00 ± C</td>
<td>2.40 ± D</td>
<td>2.2 ± B</td>
</tr>
<tr>
<td></td>
<td>0.246 a</td>
<td>0.270 b</td>
<td>0.447 b</td>
</tr>
</tbody>
</table>

*A-D: values within a column following different letters are significantly different (P<0.05).

**a-c: values within a raw following different letters are significantly different (P<0.05).

Acknowledgment

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References

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