STUDIES ON EXPERIMENTAL INFECTION OF PIGEONS WITH NEWCASTLE DISEASE VIRUS

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ABSTRACT

Newcastle disease (ND) is highly contagious disease, caused by pigeon paramyxovirus serotype-1 (PPMV-1) is a variant of avian Paramyxovirus serotype-1 (APMV-1), causing ND in poultry and pigeons. This study was carried out to follow up the behavior of NDV in experimentally infected pigeons in order to determine to any extent pigeons could be a vector in ND transmission and at any extent pigeons could be immunized against the disease. It was found that one of 40 experimentally infected pigeons (2.5%) with the virulent NDV; showed signs of illness represented by off food; ruffle feather and diarrhea on the fifth day post infection. This pigeon was still alive but with underweight. Also it was found that 95% of collected samples from experimentally infected pigeons (group-1) were found to be positive to NDV as demonstrated by HA test while 70% of collected samples of contact pigeons (group-2) were positive to NDV by the same test. HI test was carried out on such samples to confirm that the shedding virus is NDV revealing 87.5% and 60% positivity. On the other side none of samples collected from group-3 (control) showed positive results to NDV. In addition ND-HI antibody titers in the experimental pigeons were 11log2; 7log2 and 0 in pigeon group-1; group-2 and group-3 respectively. From the results it could be concluded that pigeons may play a part in transmission of ND although they not show clear signs of the disease.

Key Words: Newcastle disease; pigeon paramyxovirus serotype-1; HA; HI

1. INTRODUCTION

Pigeons are one of the few domesticated birds, which are kept by the humans for variety of purposes such as food, hobby (racing) and treatment of various diseases. A variety of diseases affect pigeons but viral diseases predominate [1]. Among viral diseases, Newcastle disease (ND) is the most important disease [2].

In pigeons, ND is highly contagious disease, caused by pigeon paramyxovirus serotype-1 (PPMV-1), which is a variant of Avian Paramyxovirus serotype-1 (APMV-1), causing ND in poultry [3, 4]. Pigeons are also susceptible to Avian Paramyxovirus type-1 [5].

On the basis of its virulence, Newcastle disease virus (NDV) has been classified into three strains: velogenic, mesogenic and lentogenic. These strains produce highly acute, moderate and mild type of infection in poultry, respectively. Only velogenic strain causes disease in pigeons [6].

The pathogenic Newcastle viral strain for chickens was unable to produce clinical signs of the disease in experimentally infected pigeons, although it induced the humoral antibody response and produced NDV genome shedding from 5 days post-infection (dpi) to 24 dpi. Therefore, viral genome shedding occurred for 20 days. The viral genome was detected in all birds,
between 11 and 13 dpi. Furthermore, the high infectivity of the virus was confirmed, as all non-inoculated sentinel pigeons showed antibody levels as high as those of inoculated birds [7]. Newcastle disease virus (NDV) was isolated from a field outbreak in pigeons. The virus was characterized by haemagglutination test (HA) and confirmed by haemagglutination inhibition test (HAI). The pathotyping was done by mean death time (MDT), intracerebral pathogenicity index (ICPI) and intravenous pathogenicity index (IVPI). The ELD50 of the velogenic strain was 10-4.66/0.1 ml [8].

The present work was designed to investigate to what extent pigeons could be affected by Newcastle disease virus infection as a part in another work deals with pigeon vaccination with ND and pigeon paramyxovo vaccines.

2. MATERIALS AND METHODS

2.1. Pigeons.
Sixty local bread squabs where screened before application of the experimental work using HI and SNT and found that they were free from PPMV type 1 and ND antibodies. These pigeons were used for investigation of their ability to be infected with Newcastle disease virus. They were divided into 3 groups as follow:

*Group-*1 of 40 pigeons was infected through the intranasal route with NDV where the used dose was 106EID50/ bird injected intramuscularly.

*Group-*2 of 10 birds was kept in contact with infected pigeons.

*Group-*3 of 10 pigeons was kept as control. Pigeon groups were kept separately under hygienic measures and subjected to daily clinical examination up to 15 days post infection where clinical and postmortem findings were recorded.

2.2. Virulent Newcastle Disease virus.
Velogenic viscerotropic NDV strain was supplied kindly by Veterinary Serum and Vaccine Research Institute, Abbassia, Cairo. It had a titer of 106EID50/ml.

2.3. Sampling:
2.3.1. Samples for virus recovery.

Brain; lung and preventriculous samples were obtained from dead and scarified birds to recover the causative virus.

2.3.2. Serum samples:

Serum samples were obtained from survived and in contact control birds to monitor the induced antibodies.

2.4. Virus recovery:
The collected samples were homogenized under sterile conditions and subjected to HA and HI tests to investigate the presence of ND virus.

2.5. Newcastle disease antiserum:

It was obtained from vaccinated chickens under experimental conditions where 5 chickens 45 day old were vaccinated with the locally produced inactivated oil ND vaccine supplied by Veterinary Serum and Vaccine Research Institute.

2.6. Haemagglutination test (HA):

HA test was carried out to detect NDV in organ samples obtained from affected experimentally infected pigeons according to [9].

2.7. Haemagglutination inhibition (HI) test:
The test was carried out to confirm that the induced symptoms in experimentally infected pigeons were due to NDV and to detect the induced antibodies in survived birds. It was done using the Beta procedure (constant virus plus diluted serum). The test was carried out according to the standard method of examining poultry biologics [9].

3. RESULTS

The present obtained results (Table-1) showed that one of 40 experimentally infected pigeons with the virulent ND virus; showed signs of illness represented by off food; ruffle feather and diarrhea on the fifth
day post infection. This pigeon was still alive but with underweight level.

3.2. Regarding shedding of NDV from experimentally infected pigeons (Table-2) it was found that 95% of collected samples from experimentally infected pigeons (group-1) were found to be positive to NDV as demonstrated by HA test while 70% of collected samples of contact pigeons (group-2) were positive to NDV by the same test. HI test was carried out on such samples to confirm that the shedding virus is NDV revealing 87.5% and 60% positivity among samples obtained from infected and contact birds respectively. On the other side none of samples collected from group-3 (control non infected pigeons housed separately from other groups) showed positive results to ND virus.

3.3. Table (3) demonstrates that HI antibody titers in the experimental pigeons were 11log2; 7log2 and 0 in pigeon group-1 (experimentally infected pigeons), group-2 (in contact pigeons) and group-3 (non infected control) respectively.

Table (1): Induction of experimental Newcastle disease infection in pigeons

<table>
<thead>
<tr>
<th>Pigeon groups</th>
<th>Number of pigeons</th>
<th>Number of affected pigeons</th>
<th>Number of dead pigeons</th>
<th>Number of survived pigeons</th>
<th>Percentage of infection response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimentally infected</td>
<td>40</td>
<td>1</td>
<td>0</td>
<td>38</td>
<td>2.5</td>
</tr>
<tr>
<td>Non-infected in contact</td>
<td>10</td>
<td>0</td>
<td>0</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>Non-infected Control</td>
<td>10</td>
<td>0</td>
<td>0</td>
<td>10</td>
<td>0</td>
</tr>
</tbody>
</table>

Table (2): NDV shedding from infected pigeons as detected by HA and HI tests

<table>
<thead>
<tr>
<th>Pigeon groups</th>
<th>Number of pigeons</th>
<th>Number of tested samples</th>
<th>Number of positive HA samples</th>
<th>Positive HA %</th>
<th>Number of positive HA samples</th>
<th>Positive HI %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimentally infected</td>
<td>40</td>
<td>40</td>
<td>38</td>
<td>95</td>
<td>35</td>
<td>87.5</td>
</tr>
<tr>
<td>Non-infected in contact</td>
<td>10</td>
<td>10</td>
<td>7</td>
<td>70</td>
<td>6</td>
<td>60</td>
</tr>
<tr>
<td>Non-infected Control</td>
<td>10</td>
<td>10</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Table (3): ND HI antibody titer in experimentally infected pigeons 21 days post infection

<table>
<thead>
<tr>
<th>Mean ND-HI antibody titers (log2/ml)</th>
<th>Pigeon groups</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Experimentally infected</td>
</tr>
<tr>
<td></td>
<td>11</td>
</tr>
</tbody>
</table>

4. DISCUSSION

This study was carried out to follow up the behavior of NDV in experimentally infected pigeons in order to determine to any extent pigeons could be a vector in ND transmission and at any extent pigeons could be immunized against the disease.
Experimental infection of pigeons with Newcastle disease virus

These findings in table(1) indicate that the response of pigeons to NDV experimental infection was 2.5% in agreement with what reported by [5] who stated that pigeons are also susceptible to ND and [6] who concluded that pigeons are susceptible only to the velogenic strain of ND virus. Also [7] found that experimental infected pigeons with NDV showed signs of illness by the 5th day post infection. Such observation in table(2) were recorded for 21 days post infection so they came in agreement with those of [7] who recorded NDV shedding from experimentally infected pigeons 5 days post infection up to 20 days.

Agreeing with the results in table(3), [7] reported that experimentally infected pigeons with NDV exhibited humeral antibody response between 11 and 13 days post infection and in contact birds exhibited high levels of ND HI antibody titers attributed to their attraction of the virus from infected birds.

From the obtained results it could be concluded that pigeons may play a part in transmission of ND although they not show clear signs of the disease or deaths but they attract the virus and induced specific antibodies the thing which may directs the attention toward vaccination of pigeons with ND vaccine to avoid the virus shedding to chickens or as a non specific vaccine against pigeon paramyxo virus. So, further studies are in requirement.

5. REFERENCES

دراسات على العدوى التجريبية للحمام بفيروس النيوكلاس

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الملخص العربي

أجريت هذه الدراسة رغبة في معرفة مدى استجابية الحمام للعدوى التجريبية بفيروس النيوكلاس الضار. احتمالاً للعب هذه الطيور دوراً في نقل المرض للدجاج. هذا وقد تم إجراء عدة عدوى تجريبية لأربعين حمامة بفيروس النيوكلاس الضاري (العترة فيلوجينيك) مع وضع عشر حمامات بدون عدوى والاحتفاظ بعشر حمامات أخريات دون عدوى بعداً عن المجموعتين الأولتين. وقد أظهرت النتائج أن طائر واحد من المجموعة الأولى قد أظهر بعض الأعراض المرضية مثل فقد الشهية وخشونة العين وإسهال في اليوم الخامس من العدوى دون نفوق كما تم استياب افزار الفيروس من الطيور المعدية تجريبياً من اليوم الخامس بعد العدوى وحتى 21 يوم بعد ذلك بنسبة 95% باختبار اللئلى الدموي ونسبة 70% من الطيور المجارة للطيور المعدية بينما كانت نسب تأكيي العزل باختبار مانع اللئلى 87%. 60% من الطيور المعدية المحاورة على التوالي بينما ظلت الطيور الضابطة حالة صحية جيدة. وتبني الأجسام المناعية المتكونة في أعضاء الحمام ضد التجريبة وباستخدام اختبار مانع اللئلى الدموي وجد أن طيور المجموعة المعدية تكتسب أجسام مناعة للفيروس بمعيار يصل إلى 11 لو. بينما كان هذا المعيار 7 لو في الطيور المجارة مما تقدم يمكن القول بأنه من الممكن أن يلعب الحمام دوراً ما في نقل فيروس النيوكلاس لطيور أخرى بالرغم من عدم ظهور أعراض المرض عليه أو وفيات ولكنه قد ينتج أجسام مناعية لفيروس النيوكلاس مما يؤدي إلى إمكانية تحسين للفيروس إلا أن الأمر يحتاج إلى المزيد من البحث والدراسة.

(مجلة بني للعلوم الطبية البيطرية: عدد 25(1):143-147, سبتمبر 2013)