STUDIES ON EXPERIMENTAL INFECTION OF PIGEONS WITH NEWCASTLE DISEASE VIRUS

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A B S T R A C T

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 $11\log_2$; $7\log_2$ 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

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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 paramyxo 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 was106EID50/ 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

Pigeon groups	Number of pigeons	Number of affected pigeons	Number of dead pigeons	Number of survived pigeons	Percentage of infection response
Experimentally infected	40	1	0	38	2.5
Non-infected in contact	10	0	0	10	0
Non-infected Control	10	0	0	10	0

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

Pigeon groups	Number of pigeons	Number of tested samples	Number of positive HA samples	Positive HA %	Number of positive HA samples	Positive HI %
Experimentally infected	40	40	38	95	35	87.5
Non-infected in contact	10	10	7	70	6	60
Non-infected Control	10	10	0	0	0	0

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

Mean ND-HI antibody titers	Pigeon groups		
	Experimentally infected	Non-infected in contact	Non-infected control
(log_2/ml) →	11	7	0

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.

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.

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دراسات على العدوى التجريبية للحمام بفيروس النيوكاسل

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الملخص العربي

أجريت هذه الدراسة رغبة فى معرفة مدى استجابة الحمام للعدوى التجريبية بفيروس النيوكاسل الضاري احتمالاً للعب هذه الطيور دوراً فى نقل المرض للدجاج. هذا وقد تم إجراء عدوى تجريبية لأربعين حمامة بفيروس النيوكاسل الضاري (العترة فيلوجينيك) مع وضع عشر حمامات بدون عدوى والاحتفاظ بعشر حمامات أخريات دون عدوى بعيداً عن المجموعتين الأولتين0 وقد أظهرت النتائج أن طائر واحد من المجموعة الأولى قد أظهر بعض الأعراض المرضية مثل فقد الشهية وخشونة الريش وإسهال فى اليوم الخامس من العدوى دون نفوق0 كما تم استبيان إفراز الفيروس من الطيور المعدية تجريبياً من اليوم الخامس بعد العدوى وحتى 21 يوم بعد ذلك بنسبة 95% باختبار التلزن الدموي ونسبة 70% من الطيور المجاورة للطيور المعدية بينما كانت نسب تأكيد العزل باختبار مانع التلزن 5ر87% ، 60% من الطيور المعدية والمجاورة على التوالي بينما ظلت الطيور الضابطة بحالة صحية جيدة0 وبتتبع الأجسام المناعية المتكونة فى أمصال الحمام قيد التجربة وباستخدام اختبار مانع التلزن الدموى وجد أن طيور المجموعة المعدية تكتسب أجسام مناعة للنيوكاسل بمعيار يصل إلى 11لو2 بينما كان هذا المعيار 7لو2 فى الطيور المجاورة0 مما تقدم يمكن القول بأنه من الممكن أن يلعب الحمام دوراً ما فى نقل فيروس النيوكاسل لطيور أخرى بالرغم من عدم ظهور أعراض للمرض عليه أو وفيات ولكنه قد ينتج أجسام مناعية لفيروس النيوكاسل مما يؤدى إلى إمكانية تحصينها بتحصين النيوكاسل إلا أن الأمر يحتاج إلى المزيد من البحث والدراسة.

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