SOME STUDIES ON PARAMYXOVIRUS-INFECTION IN QUAILS

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Abstract

Susceptibility of quails to experimental infection with virulent strains of paramyxovirus-1 velogenic viscerotropic (Newcastle disease virus, vvNDV, and pigeon paramyxovirus-1, PPMV-1) was studied. Mortality was: 100%, 70%, 50% in intramuscularly, and intranasaly infected quails and contact exposed chickens, respectively, upon infection with vvNDV, and the virus was readily reisolated from the internal organs of infected quails. On the other hand, quails showed high resistance to infection with the virulent PPMV-1 and could not transmit the infection to contact pigeons in the same cage.

Vaccination of quails with NDV vaccine (LaSota strain) resulted in good serological response and absolute protection against challenge with vvNDV 3 weeks pos-vaccination.

INTRODUCTION

Quails have been farmed since ancient time, they have a number of biological and physiological peculiarities. Over the past three decades, a considerable interest in commercial quail farming has arisen in many parts of the world. In developing countries, quail farming offers an economic, valuable and practical solution to the problem of animal protein (Ibrahim, 2000).

Despite the extensive and worldwide spread of quail farming, the epidemiology of pigeon paramyxovirus-1 (PPMV-1) or vvNDV among these birds has been still questionable. The role of quails in transmission of PPMV-1 and vvNDV has not yet been studied. So, the aim of the present work was to study the susceptibility of quails to infection with either viruses, and their possible role for hazard spread of infection to other birds (chickens, pigeons).

MATERIALS AND METHODS

I. Viruses

1. vvNDV strain

The local field isolate of vvNDV kindly obtained from the Veterinary Serum and Vaccine Research Institute (VSVRI) was used for experimental infection of quails. The virus infectivity titre was estimated to be $10^{7.5}$ EID_{50}/ml.

2. Virulent PPMV-1 strain

It was locally isolated and kindly obtained from the Veterinary Serum and Vaccine Research Institute (VSVRI), Cairo, Egypt. Its titre was estimated to be 10^{7} EID_{50}/ml.

II. Vaccines

NDV vaccine (LaSota strain)

The locally produced vaccine was kindly provided by VSVRI. Its estimated titre was 10^{9} EID_{50}/ml.

III. Embryonated chicken eggs (SPF)

SPF embryonated chicken eggs, 9-12 days old were obtained from VSVRI and used for virus titration and propagation.

IV. Experimental Birds

1. Quails

One hundred and twenty quails (30-45 days old) were obtained from a private commercial farm. They were checked serologically for freedom from PPMV-1 and NDV antibodies.

2. Pigeons

Pigeons of native breed (3 weeks old) were purchased from local market and checked serologically as mentioned for quail.

3. Chickens

Four weeks old commercial broiler chickens were used and checked serologically as mentioned before.

V. Experimental Design

One hundred and twenty, 30-45 days old quails were used. They were reared under strict hygienic measures in an isolated and disinfected wire floored cages. Random serum samples were taken and tested for antibodies against the two studied viruses.

They were found seronegative for both and were divided into four groups and treated as follows:

Group (1)

Thirty quails of this group were subdivided into two equal subgroups. Ten birds of each subgroup were infected with 0.25 ml/bird of vvNDV strain either by intramuscular (I/M) or intranasal (I/N) route, respectively. Five chickens were reared simultaneously with each of the infected subgroup in the same cage and served as contact exposure. All birds were observed for clinical signs and mortality for 15 days.

Group (2)

Thirty quails were similarly subdivided into two equal subgroups. Ten birds of each subgroup were infected with PPMV-1 strain (0.25 ml/bird) intramuscularly or by intranasal route, respectively. Five pigeons were reared simultaneously with each of the experimentally infected subgroups in the same cage representing contact exposure. All birds were observed for clinical signs and mortality for 15 days.

Group (3)

Thirty quails were subdivided into two equal groups and were intramuscularly vaccinated with ND vaccine LaSota strain diluted 1:20 ml either by 0.25 ml/bird or 0.5 ml/bird. They were weekly examined serologically up to 10 weeks post vaccination for antibody response. Ten birds from each subgroup were challenged 3 weeks post vaccination and were observed for clinical signs and mortality for 15 days.

Group (4)

This is composed of thirty quails, each ten of them were divided into two equal subgroups which served as non-challenged and challenged birds for the three groups.

VI. Virological and serological examinations

1. Rapid slide hemagglutination test

It was carried out according to Anon. (1971) for quick detection of hemagglutinin in the amnioallantoic fluid of virus inoculated eggs.

2. Standard quantitative hemagglutination test

This test was done to determine the hemagglutination titre in amnioallantoic fluid of virus inoculated eggs according to (Anon., 1971).

3. Hemagglutination Inhibition (HI) test

It was done using the beta-procedure (constant virus plus diluted serum) as

described by Anon (1971). This test was used for measuring the antibody response of quails, chickens and pigeons.

4. Reisolation of the viruses from collected samples

Internal organs (spleen, liver, brain) of two birds from those showed severe symptoms of group 1 and 2 were collected under complete aseptic conditions with antibiotics and used after virological preparation for inoculation into allantoic cavity of embryonated chicken eggs (ECE).

VII. Clinical evaluation of infection

Symptoms suggestive of NDV or PMV-1 infection (Shakal, 1990, Barton *et al.*, 1992 and Abou Hashem, 1993) were monitored daily for 15 days post-experimental infection.

RESULTS AND DISCUSSION

PMV-1 and NDV belonging to the genus Paramyxovirus serotype-1 infect avian species including quails (Alexander and Parson, 1984).

The role of domestic quails in spread of these viruses to other species of birds is not well studied. In Egypt, quails were recently bred commercially as an economical and practical source of animal protein.

In the present work, studies were carried out on the susceptibility of domestic quails to two highly pathogenic avian PMVs-1 and their role in transmission of infection to chicken and pigeons. Furthermore, the efficiency of ND LaSota vaccine in protection of quails against challenge with vvNDV was studied.

Results of experimental infection of quails with PPMV-1 and vvNDV via different routes are presented in Table 1. It is evident from this table that vvNDV infection of quails induced clinical signs, mainly nervous, beginning on the 5^{th} and 7^{th} days following I/M and I/N infection, respectively. On the other hand, contact infection of chickens placed in the same cage with vvNDV infected quails induced symptoms which started on the 7^{th} day and caused deaths on the 12^{th} day. Contact exposure of chickens to vvNDV-infected quails provoked HI antibody titres of 6 log_2 on the 6^{th} day post-contact (Table 2). These results indicate that quails are susceptible to infection with virulent NDV and can transmit the virus to chickens by contact exposure.

In contrast, the results revealed that PPMV-1 infection of quails neither produced clinical signs by I/M or I/N route (Table 1) nor transmitted the virus to pigeons

placed in contact, even though the latters developed low antibody titres against PPMV-1 (Table 3).

Table 4 demonstrates that NDV and PPMV-1 could be reisolated from the internal organs of experimentally infected quails (brain, spleen, liver and kidney) during 3 weeks post-I/M infection, which agreed with Hassan (1997).

A trial for vaccination of quails with ND vaccine LaSota strain (Table 5) showed, that birds which received 0.5ml/bird of the vaccine developed higher mean HI antibody titres protection rate than those which received 0.25ml/bird (Table 6) when challenged with vvNDV three weeks post-vaccination (100% protection versus 80%).

In conclusion, the results achieved from the present work showed that quails were susceptible to virulent NDV, developed nervous manifestation and the virus could be reisolated from the internal organs. Moreover, quails could transmit NDV infection to chickens in contact. They developed high antibody titre to vaccination with NDV LaSota strain and protected against challenge with virulent NDV.

On the other hand, quails showed high resistance to infection with the pigeon paramyxovirus-1 and could not transmit the infection to pigeons probably due to species tolerance.

Table 1.Clinical response of quails to experimental infection with either vvNDV or PPMV-1.

Virus	Route of Infection	No. of birds	Clinical symptoms at the following days post infection														
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
PPMV-1	I/M	10	No symptoms observed														
	I/N	10	No symptoms observed														
vvNDV	I/M	10	N	N	N	N	3/10 S	3/10 S	5/10 S	7/10 S	7/10 S	8/10 S	8/10 S	9/10 S	9/10 S	9/10 S	10/10 S
	I/N	10	N	N	N	N	N	N	2/10 S	3/10 S	3/10 S	5/10 S	5/10 S	7/10 S	7/10 S	7/10 S	7/10 S
Non-vaccinated	Contact exposed chicken to PPMV-1	5	No symptoms observed														

N: Normal S: Symptoms (Diarrhoea, paralysis, and tremor)
I/M: Intramuscular injection.
I/N: Intranasal inoculation.

Table 2. Clinical and serological response of chickens placed in contact with quails intramuscularly infected with vvNDV.

Response	Days post experimental contact infection											
	1	2	3	4	5	6	7	8	9	10	11	12
Symptoms	Ab	Ab	Ab	Ab	Ab	Ab	S	S	S	S	S	D
HI titre Mean (log_2)	-	-	-	-	-	6	7	7	6	6	5	4

- : Not Detected
Ab: Clinical signs absent
S: Symptoms
D: Death

Table 3. Clinical and serological response of pigeons placed in contact withquails intramuscularly infected with PPMV-1.

Response	Days post experimental contact infection											
	1	2	3	4	5	6	7	8	9	10	11	12
Symptoms	No symptoms											
Mean HI titre (log_2)	-	-	-	-	-	-	2	3	5	5	5	-

Table 4. : Not Detected

Table 4. Reisolation of PPMV-1 and NDV from experimentally infected quails by the I/M route.

Virus	Specimens tested	Rapid HA of inoculated eggs / Weeks post inoculation		
		1 week	2 weeks	3 weeks
PPMV-1	Brain	-	-	-
	Liver	+	-	-
	Spleen	+	-	-
	Kidney	+	+	+
NDV	Brain	++	+++	++++
	Liver	-	+	+
	Spleen	++	++	-
	Kidney	++	++	+

Table 5. Mean serum antibody titres of quails vaccinated I/M with LaSota vaccine as measured by HI test.

Vaccine	Dose	Mean log_2 HI titre								
		Weeks post vaccination								
		1	2	3	4	5	6	7	8	10
LaSota	0.5ml	2	6	8	11	10	10	9	8	7
	0.25ml	2	4	6	7	6	5	4	4	4

Table 6. Challenge results of vaccinated and non-vaccinated quails using VVND virus 21 days post LaSota vaccination.

Group	Dose of vaccine	Route	No. of birds	HI titre mean log_2 WPC	Protection against challenge	D/T
(1)	0.25ml	I/M	10	2^6	80%	2/10
(2)	0.5ml	I/M	10	2^{11}	100%	0/10
Control challenged	None	-	5	No survivors PC	0%	5/5

WPC: Weeks Post -Challenge
Vaccinated birds as well as non-vaccinated
N.B. Control received 0.25 ml of vvNDV I/M
D/T: Number of dead birds / total challenged

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بعض الدراسات على عدوى الباراميكسو فى السمان

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تمـــت دراسة قابلية طائر السمان للعدوى التجريبية بنوعين مختلفين من فيروس الباراميكسو: وهما فيروس مرض النيوكاسل والفيروس المسبب لمرض الروشة فى الحمام. سجلت الوفيات ١٠٠%، ٧٠%، ٥٠% عـــند الحقـــن بالفيروس المسبب لمرض النيوكاسل الحشوى الضارى عن طريق الحقن العضلى والتنقيط بالأنف والعدوى عن طريق الأختلاط مع الدجاج على التوالى. كما نجحت إعادة عزل الفـــيروس مـــن الأعضـــاء الداخلـــية للطيور. ومن جهة أخرى أظهر السمان مقاومة عالية عند حقنها بالفـــيروس الضارى المسبب لمرض الروشة فى الحمام. كما أنها أثبتت عدم قدرتها على نقل المرض للطـــيور بالمجـــاورة مـــع الحمام. أمكن تحصين طائر السمان باللقاح المضاد لمرض النيوكاسل عترة اللاســـوتا وأظهـــر اســـتجابة سيرولوجية عالية وحماية مطلقة ضد الفيروس الضارى المسبب لمرض النيوكاسل بعد ٣ أسابيع من التحصين.