Investigation Of The Immune Response Of Geese To Vaccination With Newcastle Disease Vaccines

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ABSTRACT

A group of 1 day old goslings was vaccinated with Hitchner B-1 by the eye drop method; another 2 groups of 2 months old geese were vaccinated with the live Komarov vaccine (for the first group) and with oil inactivated Newcastle disease (ND) vaccine (for the second group). The live ND virus vaccines did not induce clinical signs and have no detrimental effect on body weight gains. The serological studies showed that vaccinated geese developed moderate levels of HI antibody titers against NDV which were increased post-challenge. Tracheal and cloacal swabs were collected from vaccinated and challenged groups as well as the infected control group for virus reisolation, virological studies revealed that lentogenic, mesogenic or velogenic ND viruses were never reisolated from vaccinated geese neither before nor after challenge. In contrary the ND virus was detected and reisolated from the unvaccinated geese post-challenge. The protection percentages were 100% in the vaccinated geese groups as there were neither mortalities nor clinical signs were observed during the 14 days post-challenge. On the other hand the infected control group developed signs of ND with 40% mortalities. It was concluded that vaccination of geese against Newcastle disease should be taken in consideration to protect them against the disease and to avoid the probable hazard of the disease transmission to other susceptible birds.

INTRODUCTION

Newcastle disease (ND) is a paramyxovirus type-1, of many bird species. Geese and ducks are usually considered resistant even to strains which are most virulent for chickens, although outbreaks of the disease in ducks associated with NDV infection have been described serologically and molecularly determined as a causative agent *(1, 2). (3)* while the role and significance of wild geese in the epidemiology of avian diseases remains to be undetermined, it is possible that they could be of some importance as reservoirs and carriers of certain viral diseases. Recently, *(4)* characterized pathologically and genotypically 10 NDV strains of goose origin along with isolates from fowl and pigeon. *(5)* Velogenic ND viruses was isolated from visceral organs and cloacal swabs of diseased birds. *(5, 6)* stated that the goose-originated ND virus isolates could be transmitted from geese to specific pathogen free chickens. The low and short lived antibody responses post vaccination of geese were equally well measured in HI and VN tests *(7)*. Only two out of seven unvaccinated but challenged geese developed signs of ND whereas all vaccinated challenged geese remained normal but developed high to moderate levels of HI and VN antibodies.

The present work was designed as an interesting plan to investigate to what extent the local breed geese can immunologically response to Newcastle disease vaccines.

MATERIAL AND METHODS

Newcastle disease virus

Virulent velogenic viscerotropic (V.V.) local strain of Newcastle disease virus *(8)* of a titer $10^8 EID_{50}$ was supplied by the Central Laboratory for Evaluation of Veterinary Biologics (CLEVB) Abbasia, Cairo, Egypt. It was used in the challenge test of vaccinated geese.

Newcastle disease vaccines

Locally produced Hitchner-B_1; Komarov and oil inactivated Newcastle disease vaccines were kindly supplied by Veterinary Serum and Vaccine Research Institute, Abbasia, Cairo, Egypt. These vaccines were used for vaccination of different groups of geese.

Cell Culture adapted ND virus

VERO cell culture adapted ND virus which was supplied by the same institute It had a titer of 10^8TCID$_{50}$/ml and use in SN1.

Geese

Five local breed goslings of 1 day old and 15 geese of about 2 months old were screened using haemagglutination inhibition (HI) test before experimental vaccination and they were found to be free from Newcastle disease antibodies. These birds were divided into 4 groups:

The first group of young 5 goslings was vaccinated conjunctively with Hitchner-B$_1$ vaccine at the dose of 10^6EID$_{50}$/bird.

The second group of 5 old geese was vaccinated intramuscularly with the Komarov vaccine at the dose of 10^6EID$_{50}$/bird.

The third group of 5 old geese was vaccinated with the oil inactivated Newcastle disease vaccines subcutaneously at the dose of 0.5ml/ bird.

The fourth group was kept as non-vaccinated control.

All birds were kept in separate isolates under hygienic measures and serum samples were collected on weekly intervals up to 4 weeks post vaccination to monitor the induced antibodies.

Challenge test

Four weeks post vaccination all geese group were challenged with the virulent Newcastle disease virus (V.V) through I/M route using a dose of 0.5ml/ bird of 10^8EID$_{50}$/ml. The gees were kept under daily observation for 2 weeks.

ND virus reisolation

Tracheal and cloacal swabs were collected from the geese groups received live NDV vaccines at the 3rd, 5th, 7th and 14th day postvaccination, and from all geese groups post challenge at the same intervals. The collected swabs were used for NDV reisolation in SPF ECE at the 10th day of age via the chorioallantoic sac according to *(9)*.

Haemagglutination inhibition test (HI

HI test was carried out to monitor the induced immunity against ND in vaccinated geese. It was carried out according to *(10)*.

Rapid plate Haemagglutination test (HA)

HA test was carried out directly on the tracheal and cloacal swabs besides the allantoic fluids of the inoculated SPF ECE to investigate the presence of ND virus, according to the standard described method in *(11)*.

Serum Neutralization test (SNT)

SNT was carried out to estimate ND neutralizing antibodies induced in vaccinated geese, according to *(12)* and the antibody titer was calculated as the reciprocal of the final serum dilution which neutralized and inhibited the CPE of 100-200TCID$_{50}$ of ND virus according to *(13)*.

RESULTS AND DISCUSSION

Table 1. Geometric mean NDV HI antibody titers in different geese groups

Group	NDV HI antibody titer (log_2)/ weeks post vaccination						
	0 time	1 WPV*	2 WPV	3 WPV	4 WPV	1 WPC**	2 WPC
Hitchner B-1	0	3.0± 0.1	3.2± 0.12	5.1± 0.13	6.1± 0.2	4.9± 0.19	7.4± 0.18
Komarov	0	1.8± 0.14	4.6± 0.15	5.9± 0.19	6.6± 0.18	5.5± 0.18	7.5± 0.2
Oil inactivated	0	1.2± 0.1	2.4± 0.2	5.2± 0.22	7.2± 0.21	6.4± 0.13	7.6± 0.19
Unvaccinated	0	0	0	0	0	Not Done	

*WPV= Week post vaccination **WPC= Week post challenge.

Table 2. Geometric mean NDV neutralizing antibody titers in different geese groups

Different geese groups	NDV neutralizing antibody titer #/ weeks post vaccination						
	0 time	1 WPV*	2 WPV	3 WPV	4 WPV	1 WPC**	2 WPC
Hitchner B-1	0	3± 1	10± 3	20± 4	36± 4	18± 4	72± 8
Komarov	0	12± 4	18± 4	38± 6	68± 4	36± 4	136± 8
Oil inactivated	0	3± 1	18± 2	36± 4	136± 6	68± 4	132± 6
Unvaccinated	0	0	0	0	0	Not Done	

*WPV= Week post vaccination **WPC= Week post challenge.

antibody titer= the reciprocal of the final serum dilution which neutralized and inhibited the CPE of 100-200$TCID_{50}$ of ND virus.

Table 3. Challenge of different geese groups and ND virus resiolation.

Group	Recorded signs of NDV and virus reisolation from tracheal and cloacal swabs						
	0 time	1 WPV*	2 WPV	3 WPV	4 WPV	1 WPC**	2 WPC
Hitchner B-1	Neither clinical signs nor ND virus reisolation were recorded allover the experimental period post vaccination and post challenge						
Komarov							
Oil inactivated							
Unvaccinated geese	On the 4th day post-challenge, ND signs were represented by moderate to severe depression; diarrhea; ocular and nasal discharges and recorded deaths on the 4th day (1 goose) and 5th day (1 goose) with 40% cumulative mortality percentage post-challenge. The NDV was reisolated from tracheal and cloacal swabs at the 3rd, 5th, 7th and 14th day post-challenge.						

Newcastle disease is one of the oldest known avian diseases that affect poultry population dramatically causing great economic losses. Many studies described ND and its related immunity in geese *(4-6, 14-17).* The vaccinated geese groups showed 100% protection post-challenge with no clinical signs of ND mortalities.

In the present work trials for vaccination of young (1day old) and old (2months old) geese with Hitchner-B_1; Komarov and oil inactivated NDV vaccines were carried out. The obtained results showed that live vaccines as well as the oil emulsion vaccine did not induce discernible clinical signs and have no apparent detrimental effect on body weight gains of vaccinated geese. High antibody levels post vaccination was measured in HI test. Lentogenic mesogenic (Komarov strain) or velogenic viruses were never detected nor reisolated from tracheal and cloacal swabs obtained from vaccinated birds after challenge with the VV NDV. All vaccinated geese remained normal with no clinical signs or mortalities post vaccination. The serological studies showed high levels of HI antibody titers (Table-1) as well as high levels of virus neutralizing antibodies (Table-2). That comes in agreement with *(7)* but differ with them where they recoded low levels of ND antibodies in vaccinated geese and this difference could be attributed to the geese breed and the used vaccine dose. It was noticed that the HI antibody response was decreased in all vaccinated and challenged birds in the first week post challenge and began to increase in the second week, which

may be attributed to neutralization of some circulating antibodies by the challenge virus. Unvaccinated challenged geese developed signs of ND at the 4th day post challenge represented by moderate to severe depression; diarrhea; ocular and nasal discharges and recorded deaths on the 4th and 5th day post challenge with 40% cumulative mortality percentage (Table-3). While velogenic NDV was detected and reisolated from both tracheal and cloacal swabs at the 3rd, 5th, 7th and 14th day post challenge. Similar findings in naturally and experimentally infected geese with ND virus were recorded ***(6, 7, and 18).***

It was suggested that potentially virulent strains of NDV are maintained in migratory waterfowl population in nature and that some of these strains may be transmitted to domestic poultry and acquire pathogenicity during passage in chicken population ***(19).*** It has been recorded that domestic geese do not readily excrete NDV in detectable amounts and do not play a major role in the epidemiology of ND ***(7)***. While, recently it has been cited ***(5 , 6)*** that the goose-originated ND virus isolates could be transmitted from geese to specific pathogen free chickens, illustrating the potential threat they posed to the chicken industry. So NDV could be transmitted from diseased geese to susceptible chickens causing non-neglectable mortalities.

- From the discussed data, it could be concluded that vaccination against ND should include not only chickens but geese also in order to control and eradicate the disease.

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الملخص العربى

استبيان مدى استجابة الأوز للتحصين بلقاحات النيوكاسل

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*المعمل المركزى للرقابة على المستحضرات الحيوية البيطرية-العباسية- القاهرة

أجريت هذه الدراسة للتعرف على مدى استجابة الأوز المحلى للتحصين بلقاحات النيوكاسل لحماية هذه الطيور ضد المرض ومنع انتقاله للطيور الأخرى القابلة للعدوى حيث أظهرت البحوث العلمية إمكانية إصابة الأوز بالمرض والدور الذى قد تلعبه فى وبائيته.

وعلى ذلك فقد تم تحصين مجموعة من الأوز الصغير (عمر ١ يوم) باللقاح العينى ومجموعة من الأوز الكبير (عمر شهرين) باللقاح الحى المستضعف فى حين تم تحصين مجموعة أخرى من الأوز الكبير باللقاح المثبط الزيتى مع ترك مجموعة دون تحصين كضابط للتجربة. ولم تحدث اللقاحات الحيه أي أعراض مرضية أو تأثير ملحوظ علي زيادات الورن. هذا وقد أظهرت الطيور المحصنة مستويات جيدة من الأجسام المناعية قياسا باختبار التلزن الدموى المثبط والذي إرتفع بعد إجراء إختبار التحدي. وعند فحص مسحات من الحلق والمجمع من الطيور المحصنة لم يستدل على وجود فيروس النيوكاسل بها باستخدام اختبار التلزن الدموى.

كما لم تظهر أية أعراض مرضية على هذه الطيور بعد التحصين ولا بعد إجراء اختبار التحدى بعترة الفيروس الضارية. وكانت نسبة الحماية ١٠٠% للأوز المحصن حيث لم تحدث وفيات أو أعراض مرضية خلال ال١٤ يوما بعد إجراء إختبار التحدي. فى حين اظهرت الطيور الغير محصنة أعراض مماثلة لمرض النيوكاسل ونسبة وفيات ٤٠% عند تطبيق اختبار التحدى عليها.

وعلى ذلك فإنه يجب أن يأخذ تحصين الأوز ضد مرض النيوكاسل فى الاعتبار حماية لهذه الطيور ومنعا من انتقال المرض للطيور الأخرى القابلة للإصابة وضمنا لما يتبع فى التحكم ومحاولة القضاء على المرض.