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Evaluation of Different Programs of Newcastle Disease Vaccination in Japanese Quail (*Coturnix coturnix japonica*)

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Abstract: The objective of this study was to evaluate different programs of the vaccination against Newcastle disease in Japanese quails. Two hundred and eighty eight 5-week-old Japanese quails were distributed into six different vaccine programs: T1 - vaccinated with LaSota strain of Newcastle virus (NDV) via intra-conjunctiva instillation at five weeks of age and revaccinated at 13 and 21 weeks with NDV LaSota strain via intra-conjunctiva instillation; T2 - vaccinated with NDV B1 strain via intra-conjunctiva instillation at five weeks of age and revaccinated at 13 and 21 weeks of NDV B1 strain via intra-conjunctiva instillation; T3 - vaccinated with NDV Ulster 2C strain via intra-conjunctiva instillation at five weeks of age and revaccinated at 13 and 21 weeks of age with Ulster 2C strain; T4 - vaccinated with NDV VG-GA strain via intra-conjunctiva instillation at five weeks of age and revaccinated at 13 and 21 weeks with NDV VG-GA strain via intra-conjunctiva instillation; T5 - vaccinated with NDV LaSota strain, which was inactivated and emulsified in mineral oil, subcutaneous, at five weeks of age and were not revaccinated; and T6 - not vaccinated. At 17 and 25 weeks of age, all birds were challenged with a velogenic strain of NDV and a group of specific pathogen free (SPF) broilers was used as control of the virus. Five and 14 days after challenge, tracheal and cloacal swabs were collected from each bird for virus isolation. The quails from all experimental groups did not show any clinical sign of NDV, although 100% of SPF broilers that died after the challenge showed clinical signs of Newcastle disease. NDV isolation was possible in all SPF broilers and 5 and 14 days after challenge in the non-vaccinated group of quails (T6), suggesting that quails can be NDV carriers. In the vaccinated groups, NDV was not re-isolated, demonstrating the importance of vaccination to control virus dissemination by quails infected with NDV.

Key words: Japanese quail, vaccination, Newcastle disease, NDV carrier

Introduction

The Newcastle disease is a very important poultry virus and can affect both domestic and wild birds. This disease is the main health barrier for the international trade of poultry and poultry products (OIE, 1996). Newcastle disease currently has a worldwide distribution and affects several birds species (Kaleta and Beldauf, 1988). Therefore, vaccination and biosafety measures are needed to control this disease in commercial poultry.

The commercial production of Japanese quails (*Coturnix coturnix japonica*) is extensively distributed in several countries around the world and many studies showed that this species can easily adapt to commercial management conditions, with good performance in terms of meat and egg production (Murakami, 1991). However, there is little information available on health control programs in this species. In addition, as today happens with broilers and turkey, quails will probably be intensively produced and the high bird concentration in some areas may cause the dissemination of infectious diseases.

The present study was carried out to evaluate vaccination programs against Newcastle disease in Japanese quails.

Materials and Methods

Experimental birds and management: A total number of 288 5-week-old female Japanese quails (*Coturnix coturnix japonica*) were distributed into six treatments of 48 birds each, as shown in Table 1. All birds, except those in the control group, were vaccinated against Newcastle disease at 10 and 22 days of age, with a vaccine containing the live virus strain 2C, via intra-conjunctiva instillation.

The diet was based on corn and soybean meal, according to levels described by Murakami (1991) for each life period of the Japanese quail. Birds where housed in cages, with water and feed offered *ad libitum*. Management procedures were according to Murakami (1991).

Vaccines: Recently manufactured, live or inactivated NDV vaccines were applied to each experimental group according to Paulillo (1980, 1984 and 1989) and Paulillo (1982, 1987 and 1996). Vaccine titers were obtained by determining 50% of the embryo-infecting dose in embryonated eggs of specific pathogen free breeders at days 8 to 10 of incubation. The titers of the live vaccines with the strains LaSota, VG-GA, Ulster 2C and B1 were 7.2 log 10/0.1 ml, 7.2 log 10/0.1 ml, 7.15 log 10/0.1 ml

Table 1: Experimental groups

Group	Vaccination (5 wk)	Administration Route	Revaccination intra-conjunctiva route (13 and 21 wk)
I	LaSota	Intra-conjunctiva	LaSota
II	B1	Intra-conjunctiva	B1
III	Ulster 2C	Intra-conjunctiva	Ulster 2C
IV	VG-GA	Intra-conjunctiva	VG-GA
V	Oil	Subcutaneous	---
VI*	Control	---	---

Table 2: Results of challenge with viscerotropic and velogenic Newcastle disease virus in quails at 17 and 25 weeks of age

Group	Vaccination (5 wk)	Administration route	Revaccination intra-conjunctiva route (13 and 21 wk)	Number of birds	% Total protection
I	LaSota	Intra-conjunctiva	LaSota	16	100.0
II	B1	Intra-conjunctiva	B1	16	100.0
III	Ulster 2C	Intra-conjunctiva	Ulster 2C	16	100.0
IV	VG-GA	Intra-conjunctiva	VG-GA	16	100.0
V	Oil	Subcutaneous	- - -	16	100.0
VI	Control	- - -	- - -	16	100.0
		SPF Broilers		16	0,0

Table 3: Results of virus isolation in quails after challenge (17 wk of age)

Group	Vaccination (5 wk)	Revaccination intra-conjunctiva route (13 and 21 wk)	Viral Isolation			
			5 days after challenge		14 days after challenge	
			T	C	T	C
I	LaSota	LaSota	-	-	-	-
II	B1	B1	-	-	-	-
III	Ulster 2C	Ulster 2C	-	-	-	-
IV	VG-GA	VG-GA	-	-	-	-
V	Oil	- - -	-	-	-	-
VI	Control	- - -	+	+	+	+

T = Trachea, C = Vent, + = Isolation positive, - = Isolation negative

Table 4: Results of virus isolation in quails after challenge (25 wk of age)

Group	Vaccination (5 wk)	Revaccination intra-conjunctiva route (13 and 21 wk)	Viral Isolation			
			5 days after challenge		14 days after challenge	
			T	C	T	C
I	LaSota	LaSota	-	-	-	-
II	B1	B1	-	-	-	-
III	Ulster 2C	Ulster 2C	-	-	-	-
IV	VG-GA	VG-GA	-	-	-	-
V	Oil	- - -	-	-	-	-
VI	Control	- - -	+	+	+	+

T = Trachea, C = Vent , + = Isolation positive, - = Isolation negative

and 7.35 log 10/0.1 ml respectively. Titer of the inactivated vaccine with LaSota strain was 9.5 log 10/ml and this vaccine was emulsified in mineral oil.

Challenge: At 17 and 25 weeks of age, 16 birds per group were challenged with a viscerotropic strain of NDV. This virus has intra-cerebral pathogenic index of 1.78 and embryonic death time of 48 hours, with a 50% embryo infecting dose titer of 8.15 log 10/0.1 ml. Distilled water was used as diluent for the inoculum that was instilled by oculo-nasal route, according to the Code of Federal Regulations (1993). In order to evaluate virus pathogenicity, a group of Specific-Pathogen-Free (SPF) 30-day-old broilers was used. The birds were housed in isolators with filtered air and offered feed and water *ad libitum*.

At five and 14 days after the challenge, tracheal and cloacal swabs were collected from all birds of each group to carry out virus isolation, according to methodology of Reed and Muench (1938).

Results and Discussion

The results of the challenge with viscerotropic velogenic NDV in quails are shown in Table 2. All groups of quails, vaccinated or not against NDV, did not show any sign of Newcastle disease after challenge, which is consistent with the observations of Higgins and Wong (1968) and Higgins (1971). On the other hand, 100% of the SPF broilers died in response to the challenge. Seventy-two hours after the challenge, these SPF broilers presented depression, anorexia, ruffled feathers, conjunctivitis, respiratory problems, dyspnea, severe and green diarrhea and death. In the necropsy, petechial hemorrhages were observed in the proventriculus and necrotic hemorrhagic lesions in the trachea, small intestine and cecal tonsils. NDV was isolated from theses SPF broilers, indicating that the virus utilized in the challenge had the potential to cause disease.

The results of virus isolation are presented in Table 3 and show that the virus was isolated in quails of control group (not vaccinated against NDV - T6) at 5 and 14 days after challenge. This confirms the susceptibility of this species to NDV, as demonstrated by Reis and Nóbrega (1956) and Lancaster and Alexander (1975). These results provide evidence that Japanese quails can carry NDV for at least 14 days after infection, which is very important for the epidemiology of this disease. Unfortunately, there is no information as to the importance of quails as NDV carrier, or as to the potential risk factor of the dissemination of this disease by quails to other food-producing poultry, such as broilers, turkeys and layers, that may be raised close to the quail habitat.

In contrast, NDV was not isolated from groups of quails that were vaccinated against NDV. This suggests that vaccination, independent of the vaccination program used, can efficiently eradicate this virus in quails and thus it can be important for the epidemiological control of virus dissemination to other poultry species. In addition, further studies should be developed to establish the importance of carrier state of quails to the dissemination of this disease in the field.

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