

GEL DROPLETS VACCINATION METHOD FOR THE DELIVERY OF NEWCASTLE DISEASE VACCINE IN THE BARN

Majed A. Al-Attar and Eng H. Lee

Vetech Laboratories Inc., 131 Malcolm Road, Guelph, Ontario, Canada N1K 1A8

SUMMARY

Gel droplets vaccination as a method for the delivery of coccidiosis vaccine in hatchery and barns has been used successfully for the last few years. Experimental use of delivering infectious bursal disease (IBD) and *Salmonella* vaccines using gel droplets again showed that this also can be extended to (header, and control chicks by water through bell-shaped drinkers. Enzyme linked immunosorbent assay (ELISA) test on serum samples collected three weeks after vaccination showed that 9/10 of chickens vaccinated by gel droplets spray have antibody to Newcastle disease virus (NDV) compared to 8/9 chickens by drinking water. The mean ELISA titers were 2305 and 2946 in chickens vaccinated by gel droplets and in bell-shaped drinker respectively. These results show that NDV vaccine can also be delivered by gel droplets method.

INTRODUCTION

Newcastle disease (ND) is a highly contagious disease affecting chickens and other avian species such as turkey and pigeons (1). The ND virus (NDV) is widely distributed and the occurrence of pathotypes is different from area to area, but the lentogenic strains of NDV are worldwide in distribution (8). Beside biosecurity practices; vaccination is one of the most common practices to control NDV in most parts of the world. Live NDVs of low virulence or of moderate virulence as well as inactivated vaccines are used for vaccination of poultry. NDV live vaccines may be applied individually by the conjunctival or intranasal application or the beak dipping. More commonly, live NDV vaccines are administered in drinking water or delivered as a coarse spray (1,8). In drinking water application of NDV vaccines, the virus may be inactivated by disinfectant in the water, and sometimes even by the type of pipes or vessels used (1). The laborious steps of water vaccination likely add costs to the application of vaccines (2). The use of the gel droplets spray method may make these laborious steps of water vaccination unnecessary (5,6,7). This study is an attempt to show that gel droplets delivery system can be used successfully to vaccinate chickens against ND.

MATERIALS AND METHODS

Experimental chickens. All the chicks here were hatched in our laboratory from SPF eggs obtained from Sunrise Farm Inc. Hatchlings were placed in single-use cardboard boxes and housed in a disinfected isolated quarter. Feed and water were supplied *ad libitum*. At day nine 25 chicks/experiment were divided into three groups. Two groups of 10 chickens each were either vaccinated by water or by gel. Five chicks served as unvaccinated controls.

The gel diluents. The gel-sprayed vaccines were delivered with 1.3% of the 60/40 gel diluent of Vetech Laboratories Inc. and 0.1% of xanthan gum was added (Lee, USA Patent pending). Red or green food color was added to the mixture as an indicator for vaccine take.

NDV vaccination. The NDV vaccine stabilizer was prepared by suspending 2.5 g/L of skim milk powder in distilled water (3). The lyophilized 1000 doses NDV vaccine (B1 type, Fort Dodge) was first dissolved in 4 mL of the vaccine stabilizer then added to gel diluent or to the water, both containing 2.5% skim milk powder. In the first experiment the compatibility of the NDV vaccine with the gel diluent was tested. The NDV vaccine was mixed with the gel diluent and compared to mixing in water. The chickens were divided randomly into three groups: NDV Gel vaccinated, NDV water vaccinated, and unvaccinated controls. Each group of chickens were kept in a single-use cardboard box. After dissolving the lyophilized NDV, 0.25 mL was added to either 625 mL of gel diluent or water. Water was withdrawn for 2.5 h before vaccinating the chickens. Newcastle disease virus vaccine suspended in gel or in water was given in bell-shaped drinkers, at the rate of 10 mL/chicken. In the second experiment, 3 mL (750 doses) were added to 375 mL of the gel diluent and about 0.5 mL/chicken was used for the droplets spraying. The remaining of the reconstituted vaccine (250 doses) was added to 2.5 L of the stabilizer, and 10 mL/chicken was used for the water vaccination and given in a bell-shaped drinker. For gel droplets vaccination, chickens were placed in a cardboard disposable box and sprayed from the top, and left to preen the sprayed vaccine. The reconstituted ND vaccine in the gel was delivered using hand held sprayer attached to it a special multi-opening device

(header). Water was withdrawn from both groups for about two h before vaccination.

Blood sampling. Blood samples were withdrawn from jugular vein using 1 mL disposable syringes and sera were separated by centrifugation. Samples were collected from chicks at 3, 14, and 21 days post vaccination. Sera were stored frozen at -20°C, and then submitted to the Animal Health Laboratory, University of Guelph, to test for the presence of antibody to NDV using ELISA tests.

RESULTS

NDV vaccination. The NDV vaccine was well consumed by the chickens whether reconstituted in water or in gel when placed in the bell-shaped drinkers. When the vaccine in gel was sprayed on the chickens, the droplets were preened and most droplets were picked up within minutes.

Antibody response to NDV vaccination. In the first experiment, the mean ELISA titers of chickens vaccinated in water and gel diluent are shown in Table 1. The antibody response of chickens was low in both groups whether they are vaccinated in water or in gel diluent two weeks post vaccination (Table 1). The mean antibody titers was higher in both vaccinated groups, at three weeks post vaccination but the group that received the vaccine through gel diluent appear to have higher mean ELISA titers, and 9/10 chickens responded to vaccination compared to 8/9 of the chickens that were vaccinated in water (Table 1). In Experiment 2 the mean antibody titer of the group vaccinated by water in bell-shaped drinkers were generally higher than those titers of chickens vaccinated by gel droplets method at two and three weeks after vaccination (Table 1); however, more chickens have detectable antibodies in gel droplets vaccinated than water vaccinated chickens at two and three weeks after vaccination (Table 1). At two weeks post vaccination 8/10 and 6/10 chickens were positive in gel droplets method and water vaccination respectively. At three weeks post vaccination 9/10 and 8/9 were positive in gel droplets method and water vaccination respectively (Table 1).

DISCUSSION

Adding this gel droplets method for delivering NDV vaccine to replace the more tedious procedure by drinking water should be an advantage. This alternative method helps the live vaccine to avoid chlorine before and after vaccination as well as cutting short the stress of water deprivation to the birds (2,3,4). In this study, water withdrawal was not necessary in Experiment two for the gel spray method but was practiced to treat vaccinated groups equally. In this study, it was shown

that the mixing of NDV vaccine with the gel diluent did not interfere with the immune response of the vaccinated chickens when given orally. In fact, the mean ELISA antibody titer in Experiment 1 was slightly higher in chickens than of the positive controls three weeks post vaccination (Table 1). In the second experiment more chickens responded to NDV vaccine in the group that was vaccinated by gel droplets than those vaccinated by water at two and three weeks post vaccination, but the mean titer was lower (Table 1). The reason for that could be the lower amount of the vaccine that consumed after spraying compared to the longer exposure of the entire volume consumed from the bell-shaped drinker. This explanation is in agreement with the result of Experiment 1: when the chickens had the chance to consume larger volume from the vaccine, better response was obtained (Table 1). Perhaps increasing the volume to 0.6 mL/chicken or higher may give better response from the gel droplets vaccinated chickens (9).

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Table 1. Mean ELISA antibodies titers of chickens vaccinated against Newcastle Disease, delivered by gel droplets spray method, or in bell-shaped drinkers either in gel diluent or in water.

Vaccine delivery	3 days PV ^A	Week 2 PV	Week 3 PV
Experiment 1			
Water vaccination in Bell-shaped drinkers	-	179 ^B (1/10 ^C)	1565 (8/10)
Gel vaccination in Bell-shaped drinkers	-	155 (1/10)	1609 (9/10)
Unvaccinated	39 (0/5)	86 (0/5)	362(1/5)
Experiment 2			
Water vaccination in Bell-shaped drinkers	1 (0/3)	2141(6/10)	2946 (8/9)
Gel droplets Spray	1 (0/3)	788 (8/10)	2305 (9/10)
Unvaccinated	26 (0/3)	122 (1/5)	159 (1/5)

^APV= post vaccination.

^BMean ELISA titers.

^CNumber positive/total tested.

EFFICACY OF VAXXITEK™ AND A COMMERCIALY AVAILABLE OIL-EMULSION NDV VACCINE ADMINISTRATION SIMULTANEOUSLY BY THE SUBCUTANEOUS ROUTE USING THE ACCUVAC™ TWINSHOT OR THE ONE-SHOT MACHINES TO VACCINATE DAY-OLD COMMERCIAL BROILERS

Rafael J. Fernandez, Julio Cruz, Francisco Rojo, Hector Garcia, Jerome Baudon, and Nikki Pritchard

Merial Select, Inc. Gainesville, GA

Two hundred seventy (270) one-day-old commercial broilers, Harrison Poultry Flock 8-2, were divided into two different vaccination treatments groups. The birds in Groups 3 and 4, the non-vaccinated, challenged and non-challenged controls, respectively, were placed into their designated units before the vaccinations. The remaining birds were then vaccinated with VAXXITEK™ and the NDV oil-emulsion with either the ACCUVAC™ Twinshot or the Twinshot-Plus Machines. The birds were vaccinated subcutaneously (SQ) with 0.2 mL per chick with VAXXITEK or with 0.1 mL per chick with the NDV oil-emulsion. After the SQ vaccinations, all the

birds in Groups 1 and 2 were vaccinated IO with NDV La Sota, 0.03 mL per dose/bird. On study day five, 90 birds in Groups 1-3 were challenged with the vvMDV RB1B, by the intraperitoneal (IP) route, 0.2 mL per bird. The birds were observed daily for 45 days post-challenge for any unfavorable reactions to the challenge, particularly death or depression.

On study day 21, 10 birds in Groups 1-2 and five birds in Groups 3-4 were wing-bled and sera was collected for NDV hemagglutination inhibition (HI) antibody testing and IBDV ELISA evaluations. Fifty birds in Groups 1-3 were challenged with NDV GB Texas, 0.03 mL/IO dose. In addition, another 50 birds