SHORT COMMUNICATION

EFFICACY OF DIFFERENT ADMINISTRATIVE ROUTES OF NDVAC 1174/08 IN BROILERS

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ABSTRACT. The performance of NDVAC 1174/08 developed by the Veterinary Research Institute (VRI) was assessed through different routes of administration in broiler chickens. 30 broiler chickens of 25 days old, mixed sex, and unrecorded weight were commercially purchased for this study and were divided equally into three groups according to the routes of administration, which are intramuscular, intranasal, and control group. All broilers except for the control group were vaccinated once when they were 26 days old with a NDVAC 1174/08 dose of 106.5/ per bird, whether intramuscular or intranasal. Phosphate buffer saline (PBS) was administered by intranasal as placebo for the control group. Serum sample from all broilers were taken at 3, 5, 7, 10, 14, 21, and 28 days day post vaccination (dpv). The Haemagglutination Inhibition (HI) test was used to identify Newcastle Disease (ND) antibodies in all serum samples. Results for the effectiveness of the intramuscular method showed mean HI titer (Log_2) of 4.35 beginning to rise at 7 dpv. On the other hand, intranasal route exhibited mean HI titer (Log_2) 4 beginning at 10 dpv. No antibodies of ND were found in control group. NDVAC1174/08 demonstrated better antibody response through intramuscular route as compared to the intranasal route.

Keywords: intramuscular, intranasal, Newcastle disease vaccine, Haemagglutination inhibition, broiler

INTRODUCTION

The World Organization for Animal Health describes Newcastle disease (ND) as the infection of poultry with virulent strains of the Newcastle disease virus (NDV). The respiratory, gastrointestinal, nervous, and reproductive systems are primarily infected by these viruses. ND is considered as a significant challenge in the poultry industry, as it is highly contagious and results in significant financial losses (Anjum *et al*., 2020).

According to Miller *et al.* (2013), the infection of birds with virulent strains of the NDV results in one of the most significant infectious diseases in poultry industry, while ND's presence causes vast economic losses due to mortality and carcass condemnation. The World Organization for Animal Health (OIE) received reports of ND in domestic species from 80 countries in 2018. Thus, many management techniques are employed to prevent exposure to the ND virus. One of the disease control methods recognized by OIE to launch trade activity is the concept of enclosure (compartmentalization). Other than enclosure, biosecurity and vaccination program are also practised to prevent the occurrence of disease in Malaysia. According to Arahan Prosedur Tetap Veterinar Malaysia (APTVM) (Department of Veterinary Services, 2021), biosecurity is the

main key in disease control including surveillance and a track record that requires commitment not only from industry players but also poultry premises' owners. Poultry farms should practice biosecurity and follow Good Animal Handling Practices (GAHP) guidelines and only registered and authorized vaccines from the Malaysian Veterinary Authority can be used as described in Protokol Veterinar Malaysia (Department of Veterinary Services, 2011).

In 2008 in Perak, Malaysia, NDV was isolated from cloacal swab of unvaccinated duck and genetically characterized. The NDV 1174/2008 strain from the duck was identified as a lentogenic strains by nucleotide sequencing of the fusion (F) gene and pathogenicity test. The NDV 1174/2008 strain was selected as a live vaccine candidate. It was evaluated for safety, immunogenicity, and protective efficacy against Malaysian gVII NDV 12234/2010 strain (Suriani *et al*., 2016). The study showed that the NDV 1174/08 strain produced significant antibody responses against the virus as indicated by HI activity and offered protective effectiveness against NDV challenge. It is safe to be administered intranasally to day-old chicks. The target animals could receive this vaccine by drinking water, spraying method, intranasal, or eyedrop. This study is aimed to compare the NDVAC 1174/08 performance when administered intramuscularly or intranasally.

MATERIALS AND METHODS

Vaccine preparation

NDV vaccine 1174 /08 strain of duck origin was selected as live attenuated ND vaccine candidate. The vaccine was produced in accordance with the Manual of Diagnostic Tests and Vaccines for Terrestrial Animals 2021 (WOAH, 2021) and Animals and Animal Products (2022). The freeze-dried ND 1174/08 vaccine was used in this experiment. This freeze-dried vaccine was dissolved with distilled water and given intramuscularly (100 µl/bird) and also by intranasal (30 µl/bird). The volume of vaccine is different for the same dosage due to the different route of administration. In 2013, the study on the effect of route of administration of ND vaccine on humoral immunity of broilers have been conducted. Dosage used were 0.05 ml per eye for intraocular, 0.2 ml for intramuscular and 10 ml per bird orally (Sanda, 2013).

Experimental design

Broiler aged 25 days old, and of mixed sex were purchased from a commercial farm and randomly distributed in three group accordingly. Group 1 (n=10) was administered with 100 µl of NDVAC 1174/08 per bird intramuscularly, while group 2 (n=10) was administered with 30 µl NDVAC 1174/08 per bird by intranasal route. Group 3 (n=10) reacted as a control group for this experiment and received 30 ul phosphate buffered saline (PBS) per bird intranasally. Both groups 1 and 2 were vaccinated with 1 dose of NDVAC. This research was carried out at the Viral Vaccine Chicken Experiment, Veterinary Research Institute in Ipoh, Perak.

Serological Method

At 3, 5, 7, 10, 14, 21, and 28 days after vaccination (dpv), blood samples were taken from all birds during the morning session. For blood collection, a 1cc and 25-gauge syringe, 5/8-in-long needle was inserted into the brachial wing vein at a shallow angle (approximately 10–20 °) with the bevel up (Kelly, 2013). Samples in a plastic box were transferred directly to Viral Vaccine Section after sampling. Samples were left at room temperature until serum separated about 2 or 3 hours. Serum was collected from the blood sample and inactivated at 56 °C for 30 minutes prior to testing.

The presence of antibodies against ND was tested using the haemagglutination inhibition (HI) test following the Manual of Diagnostic Tests and Vaccines for Terrestrial Animals 2021 (WOAH, 2021). Haemagglutination (HA) test was performed before proceeding with haemagglutination inhibition (HI) test to make sure the antigen performs well during testing.

Each plate's well was dispensed with 25 μL of PBS. Each serum sample was shaken before pouring 25 μL into the plate's first and last wells (used as controls). Two-fold serial dilutions were made along the row until the second last well using a multichannel pipette. Each well except the control wells in the last column received 25 μL of a 4HA dilution of the antigen. Plates should be covered with a lid and left to stand at room temperature for 30 minutes (Grimes, 2002).

25 μL of 0.8 percent washed red blood cells was added to each well, including the control wells in the last column. The plates were gently tapped, before being left to stand at room temperature for 45 minutes with the cover on. The settling patterns of each serum sample were analysed starting with the control serum well. The presence or absence of tear shaped streaming of RBC on the plate was observed and recorded as the endpoint.

RESULT AND DISCUSSION

The antibody level of the different group as mean HI titer (Log_2) of intramuscularly administered vaccine showed 0.38, 1.87, 4.35, 6.15, 7.14 and 7.59 followed by intranasal group 0.2, 0.5,2.6, 6, 6.6 and 4.78 (Figure 1). Intranasal route showed lower mean HI titer compared to intramuscular route. No ND HI antibody were detected in the unvaccinated group after 7 dpv until the end of the experiment.

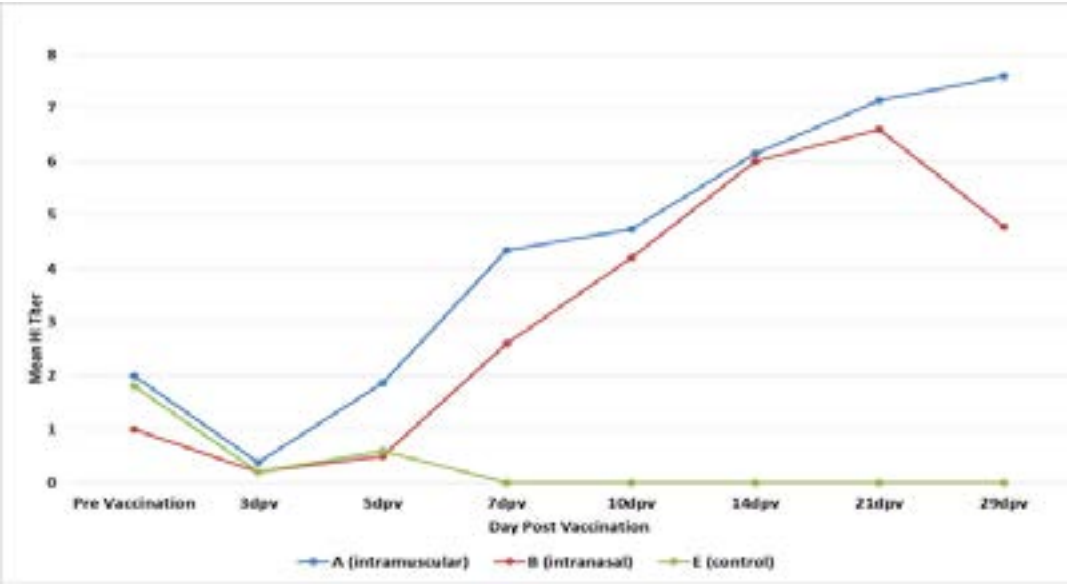

Figure 1. Mean HI antibody titer vaccinated with ND VAC 1174/08 via intramuscular and intranasal administration route against day post vaccination (dpv) with the control group as comparison

Various factors affected the level of respond or production of antibody titer. Route of vaccine administration is one of the prominent factors. Previous study by Okwor *et al*. (2013) compared the performance of NDV La Sota vaccine in grown or adult chickens via intraocular and oral routes. Their findings showed that intraocular route was preferred compared to oral route. However, the result of that study did not show that the intraocular route was superior over the oral route in La Sota administration. When challenged, both routes showed 100% protection against morbidity and mortality against ND.

Other than intramuscular and intranasal route, liquid spray and aerosol also can be chosen for vaccine administration. According to a report, mass liquid spray and aerosol vaccination of poultry has a number of problems, including uncontrolled particle deposition in the respiratory system and virus inactivation by droplet formation and evaporation (Landman *et al.,* 2015).

Besides route of administration, age of the animal can also give different antibody reaction in a vaccination program. Young chickens with high levels of maternal antibodies may interfere the result of live vaccine by lowering the amount of immunity developed (Butcher & Miles, 2003). The survival rates between the groups that had their vaccinations at one and four days of age did not differ much (Okwor *et al.*, 2013). According to Sanda and Joshua (2013) experiment's findings, immunisation against NDV (La Sota) by the intraocular, intramuscular or oral route resulted in high levels of immunity exceeding protective antibody titre.

CONCLUSION

In conclusion, our study showed both route of administration gives a good response to vaccine. However, compared to the intranasal route, the intramuscular route in this study provides superior antibody response. Farmers may choose which regime is suitable for their farm.

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