Efficacy of a Vector HVT–ND Vaccine Against Challenge of Velogenic Newcastle Disease Virus Genotype VII.2 in SPF Chickens in Malaysia

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Newcastle Disease virus (NDV) genotype VII causes significant losses in the poultry industry in various parts of the world. Molecular epidemiology studies have indicated that this velogenic strain of NDV is the predominant virus currently circulating in Asian nations including Malaysia. Therefore, new technology vaccines are required. In this study, the protection efficacy of a new vector HVT ND vaccine, (rHVT-ND*) was evaluated as standalone or added to an existing commercial vaccination program against challenge with velogenic genotype VII.2 NDV isolate IBS002/2011 in specific-pathogen-free (SPF) chickens.

There was a total of 8 treatment groups (T01 — T08) for this study. 210 SPF chicks were hatched and transported to the animal research facility for vaccination at one day of age (D1). T01 = 50 chickens received the rHVT-ND* by subcutaneous (S/C) injection, T02 = 50 chickens received rHVT-ND* by S/C injection and a live ND-B1 vaccine, by eye drop (E/D). T03 = 50 chickens received rHVT-ND* and an inactivated ND vaccine by S/C injection while a live ND-B1 by E/D. The remaining 60 chickens were the non-vaccinated controls and further equally divided into T07 = Non-vaccinated, nonchallenged control, as well as T08 = Non-vaccinated, challenged control. Meanwhile, another 150 SPF embryonated eggs were divided to three groups, 50 eggs in each group. T04 = received rHVT-ND* at the lab by *in ovo* injection (I/O) when embryos were 18 day-olds. T05 = received rHVT-ND* by I/O and a live ND-B1 vaccine by E/D at D1. T06 = received rHVT-ND* by I/O, while an inactivated ND vaccine by S/C injection and a live ND-B1 by E/D at D1. Chickens in T01-6, and T08 received the challenge virus approximately $10^{5.5}$ EID_{50} of the vNDV genotype VII.2 (Strain IBS002/2011) by E/D at D21 and D28. Clinical signs and mortality were observed for 14 days after challenge. Dead chickens were necropsied, and gross lesions were observed. Each chicken in all groups was individually weighed and blood sampling for serology tests at D21, D28, D35 and D42. Cloacal swabs were taken from 10 birds of each group at 14 days post challenge (dpc) for detecting the challenge virus shedding by RT-PCR.

The study result showed a high recovery of rHVT-ND* vaccine virus in spleen samples at D7 and D14 by qPCR indicated a good replication of HVT-ND vaccine in both S/C and I/O vaccination routes. Effect of co-administration a live ND-B1 vaccine or an inactivated ND vaccine, or both, to rHVT-ND* did not disrupt any replication rate of rHVT-ND* vaccines in birds. Prior to the challenge, no post-vaccination reactions, clinical signs, and mortality related to ND were observed for all vaccinated groups. 14 dpc either at D35 or D42, as expected, T08 had the 100% mortality. T01 = 5% mortality while the remaining T02 — 7 had none. Therefore, the clinical protection against challenge with velogenic NDV genotype VII.2 by S/C of rHVT-ND* alone (T01) was 95%, and by I/O of rHVT-ND* alone (T04) was 100% protected. The various combined vaccination programs (T02, T03, T05 and T06) were also 100% protected.

These SPF birds are without passive immunity against NDV. Therefore, it was interesting to see that the vaccine-induced active humoral immune responses were high at 3 and 4 weeks of age by ELISA NDV and NDV-F test kits in all the vaccinated birds. Since the recombinant construct contained only the fusion (F) gene of NDV, i.e., was not expressing the hemagglutinin-neuramidase (HN) protein of NDV, T01 and T04 showed the lowest HI antibody titers as expected. This observation is consistent with other published reports. In this study the body weight of chickens in all the vaccinated and T07 groups were significantly higher than T08 with no significant different among them at the end of 14 dpc observation period. The study also showed a single administration of rHVT-ND* I/O or S/C in day old chicks, significantly reduced challenge virus shedding via cloacal routes as compared to birds in T08.

It can be concluded that rHVT-ND* vaccine is capable to protect against velogenic NDV genotype VII.2 at 95% and 100% by itself, through either subcutaneous or *in ovo* administration without other ND live and inactivated vaccines. Robust immunity can be provided to the vaccinated birds by single administration of rHVT-ND* as well as in co-administration with other live and inactivated ND vaccines.

*At the time of abstract submission, Poulvac® Procerta® HVT-ND was registered in AE, BO, BR, CA, CO, DZ, EC, EG, IN, JO, KW, MA, MX, PE, PH, PK, TH, TR, US. For updated information about product availability and marketing authorizations, please contact local Zoetis representatives.

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