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A Pilot Study on effects of vaccination on immunity of broiler chickens

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Abstracts
A pilot study was carried out with the aim of highlighting the effects of NDV vaccine on the immune responses of broiler chickens challenged with NDV. Twenty (20) broilers of day-old were used for the study. They were grouped into five of four per group. During the study they were fed with standard feeds and clean water *ad libitum.* Both vaccinated and unvaccinated groups were challenged with 0.2 saline suspension of 10^6 ELD_{50} intradermal inoculation of NDV challenged strain. The vaccinated groups showed neither clinical signs nor symptoms of NDV infections while unvaccinated group showed 100% mortality after 48hr. This result indicate that vaccines is still very important in the prevention, management and control of poultry diseases as maternal immunity passed on to the young chicks at precocial stage could not be relied on to fight against infectious disease in broiler chickens. Therefore, the use of locally produced vaccines should be encouraged among farmers for the prevention, control and management of outbreaks of viral infections in our community.
Key: Challenged, Poultry birds- broilers, Newcastle disease virus, Vaccination

1.0 Introduction

The problem of viral diseases (pathogenicity) in relation to mortality and morbidity in human population has been a subject of great interest to man. Great scientific strides have been made: the advent of electron microscope has provided us the opportunity to have greater insight to the physiological and anatomical structure of the viruses complex; serology can permit us a peep into molecular changes in an infected host and vaccinology can be relied on to provide a blanket protection against infection by this infective particles'. However, the questions of whether we have sufficient knowledge of the disease, it's courses and effects so as to develop appropriate tools and interventions for its control and using them to the maximum advantage still remain. The development of the appropriate tools and measures of intervention for the control of diseases falls within the purview of immunomodulation. Vaccination is an effective means to prevent and/or reduce the adverse effects of specific diseases in poultry. Poultry refers to birds that people keep for their use, and generally includes chicken, turkey, duck, goose, quail, pheasant, pigeon, guinea fowl, pea fowl, ostrich, emu and rhea [1]. Disease-causing organisms can be classified, smallest to largest, as viruses, mycoplasma, bacteria, fungi, protozoa, and parasites. All these organisms are susceptible to chemotherapy except viruses. Control of viral diseases is dependent upon prevention through sanitation and biosecurity and by vaccination [1].

Strict sanitation and biosecurity are essential for successful poultry production. Vaccination is no substitute for effective management. It must be understood that vaccines may be effective in reducing clinical disease, but exposed birds, in most cases, still become infected and shed disease organisms [1]

The desirable consequences manifest are in form of natural resistance, recovery due to an adaptive immune response and acquired resistance whereas the undesirable consequences are those of autoimmunity, rejection, and hypersensitivity.

The disease process sets in as consequences of the failure of the immune system to effectively and efficiently combat invading foreign or 'non-stop' materials that enter the body. The basic function of the immune system is to combat the numerous pathogens present in the body. It is well established that the lowering of the individual's immunity precedes disease conditions [2]. In other words, good health can remain assured as long as the immunity is high. Various substances have been known to have an impact on an individual's immunity, such as drug, nutrition, chemical and immunization [3 - 5].

2.0 Materials and methods

2.1 Source

Twenty (20) broiler chickens of day-old from Obasanjo Hatchery, Oluyole Estate, Ibadan, Oyo State were used for this study and transported to Animal house, Achievers University, Owo, Nigeria.

2.2 Innoculums

A vial of lyophilized challenged strain of Newcastle disease virus (NDV) obtained from Regional Laboratory for Avian Influenza and Tran boundary Animal Diseases, National Veterinary Research Institute, Vom, Plateau State. The vial was transported under cold chain and standard biosafety practice to Owo, Ondo State. A saline suspension of 10^{6} ELD_{50} (50 percent Embryo Lethal Dose) were prepared by taken up the vial in 1.5 ml of sterile diluents (physiological saline), then 1 ml of the reconstituted virus was to add 99 ml of sterile normal saline (0.85% NaCl).

2.3 Treatment of broilers

They were distributed into five (5) groups of 4 broilers per cage. Groups I, II, III, IV were given intraoccular (eye drops) vaccination within 12 hr. of life using four of patients' NDV locally produced vaccines (Biovac for group I, Abic for group II, Hipra for group III and Izovac for group IV) as immune "primer". LaSota vaccine (booster dose) was given at day 21 to groups I, II, III and IV. The fifth group was the control chickens, they were not given NDV vaccine either primary or secondary dosages. Meanwhile, all the birds were vaccinated against infectious bursa disease, coccidiosis and administered orally with antibiotics (Doxygen 20/20; Kepro B. V Holland) containing gentamycin sulfate and doxycyline hydrate at the dose rate of 1g per 3L of drinking water for the first five days). The broilers were housed in battery cages of 0.301 m^2 / bird as recommended by Mustafa *et al*. [6] in the experimental animal house of Biological Science Department, College of Natural and Applied Sciences, Achievers University, Owo. All experimental protocols complied with NIH guidelines [7], as approved by the ethical and research committee, Achievers University, Owo. All the groups were challenged intramuscularly with 0.2 ml saline suspension of 10^{6} ELD_{50} at five weeks old. Their physiological response to the viral inoculums was observed; the stool frequency (diarrhea), difficult breathing and nasal discharge, and weight changes were specifically noted. During the entire study the broilers were fed with feeds compounded carefully to meet 23% crude protein (CP) and 3200K.cal. metabolizable energy (ME) for broiler starter and 20% CP and 3000K.cal. for broiler finisher. We ensured that the levels of mycotoxins in feed were maintained relatively low throughout the experiment, the quality and quantities of groundnut cake (GNC), soya bean and rice bran included in the feeds were the same for both starter and finisher mash. The percentage CP in feed and ingredients were determined by the burette method [8], while the metabolizable energy was determined by the Bomb calorimeter method [9].

3.0 Result and Discussion

The study shows that all the broilers of control group were knock-dead by the challenge within 48 hours, while all the NDV vaccinated groups survived the challenge. There were no paralysis and other clinical signs and symptoms of NDV infection. There were no observable changes in the physical activities of the vaccinated groups which indicate that, the four locally produced vaccines from NVRI, Vom that were used in this study were potent vaccines against the challenged strain. Those vaccines may have conferred on the tested bird in groups I - IV, the ability to resist the non self. This finding is in tandem with the report of Banu *et al*. [10] and Chowhdury *et al*. [11] which supported the use of live vaccine to enhance immunity. The surviving birds further highlight the significances of vaccination especially in poultry management. Live vaccines enhanced their immune responses; the administration of secondary dosage to the chicks following 'primer' dosage may have enhanced their immunity. The 'top up' dosage would have prompted secondary responses in which there would be a rapid response by memory B-lymphocyte cell resulting in marked increase in antibody production (titre) in the birds. This principle is often used in active immunization against infectious diseases in poultry management.

Little wonder what happens to maternal antibody pass - on to the chicks at precocial stage, it should have had protective effect on the defenseless young species at least for a time. According to King *et al*. [12] immune-mediated maternal effects are believed to play an integral role in the disease resistance of mammalian [13–14] and avian offspring [15–18]. Maternal antibodies passively immunize immunologically naïve young against virulent antigens and parasites that the offspring might encounter in its immediate developmental environment [19-20], yet the effects of maternal antibodies on offspring development are not well defined for these altricial-developing species [21]. Maternal antibodies are transferred across the follicular epithelium into the yolk during oogenesis [21-23]. There are three classes of avian immunoglobulins (IgY, IgM and IgA). Of these, IgY is transferred at the highest concentration and is functionally homologous to mammalian IgG [24]. IgA and IgM are found predominantly in the egg white of chicken eggs, but have been detected in the yolk at low concentration [25-26]. Prior to hatch, maternal IgY is absorbed into embryonic circulation [23], where it confers passive immunity to immunologically immature hatchlings [16, 17, 20, 24, 27]. IgM is also absorbed into circulation, though at low concentrations (<1%) [24]. There is therefore, the need to study further the maternal antibody to determine each specific antibody concentration and it half life in broiler chickens.

Table 1: Clinical signs and Physiological changes of vaccinated and unvaccinated broiler chickens following NDV challenge and control group

Treatment groups	Weight (kg) b/4 challenge	Diarrhea	Difficult breathing/ Nasal discharge	Physical activities	Paralysis (%	Mortality (%)	Weight difference(kg) (48h after challenge)
I	0.710	-	-	-	0	0	0.020
II	0.665	-	-	-	0	0	0.030
III	0.570	-	-	-	0	0	0.021
IV	0.606	-	-	-	0	0	0.019
Control	0.636	+++	+++	100	100	100	-0.040

Conclusion

This study further highlights the relevance of vaccination in disease prevention, control and management. Vaccines produce locally are potent against NDV challenged strain. And the use of vaccines should be encouraged among farmers for control and management of outbreak of Newcastle disease Virus in our locality.

Conflict of Interests

The authors do not have a direct financial relationship with the commercial identity mentioned in this paper.

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