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Comparative Efficacy of Newcastle Disease's Live Vaccines (Biovac, Clone and Lasota) in Broilers Using Hemagglutination Inhibition (HI) Test

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Abstract: Newcastle disease is a contagious bird disease affecting many domestic and wild avian species. Newcastle has a negative-sense, single-stranded genome which codes for a RNA-directed RNA polymerase, hemagglutinin-neuraminidase protein, fusion protein, matrix protein, phosphoprotein and nucleoprotein in the 5' to 3' direction. The aim of present study was to compare efficacy of Newcastle disease's live vaccines (Biovac, Clone and LaSota) in broilers using HI method. In this survey we used of 1500 broilers from 3 different identical farms. We used Biovac, Clone and LaSota vaccines in farms No. 1, 2 and 3, respectively as dissolved in drinking water on days 8, 22 and 36. At the end of period, 20 blood samples from each farm were taken. Samples were transferred to the laboratory. At the end, HI test was done on sera and antibody levels in the sera were measured. It revealed that there is significant difference between groups from aspect of titr resulted from LaSota and two others ($P<0.05$). Also, data showed that there is no significant difference between groups Clone and Biovac from aspect of titration. So, authors suggest use of LaSota as the most effective vaccine.

Key words: Newcastle Disease · Live Vaccine · Broilers · Hi Test

INTRODUCTION

The virus of Newcastle disease is classified within the genus *Paramyxovirus* of the family *Paramyxoviridae* [1, 2]. This immediately tells us certain immutable characteristics of the virus. The virus will have a genome of single stranded RNA. The inexact replication of the RNA will frequently produce variants with differences, often subtle differences, in phenotype from the parent particle [3-5]. Unless there is suitable selection pressure, these variants will not prosper. We must be aware that the populations of Newcastle disease virus that spread in the field, or the populations that make up a vaccine stock, are not clonal [5-7]. Selection pressure can alter the average behavior of the population. Of particular interest to this discussion are the variations that can evolve in pathogenicity and in thermostability [8-10]. The infectious virus particle (the virion) will have a lipoprotein envelope that will be essential for infectivity [11-13]. The proteins on the envelope will be specified by the viral genome. These will be antigenically important and they will contribute to the host specificity and the spectrum of pathogenicity of the virus [8, 12]. We will also be able to suggest other properties of Newcastle disease virus, by biological analogy with other paramyxoviruses. In particular, we will expect that Newcastle disease virus will be antigenically stable across its geographical range and with time [10, 14, 15]. Although variants will be detectable with monoclonal antibodies, or by sequence analysis, polyvalent antiserum will not easily distinguish between strains. Newcastle disease viruses are usually cultivated in the cells lining the allantoic cavity of embryonated hen eggs. Some strains kill the embryos; others do not [10, 16, 17]. The virus will also grow in cell cultures of avian origin and in some mammalian cells. The replication of some strains of the virus is indicated by the destruction

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of the host cells, a process termed cytopathogenicity [1,16]. Not all strains of Newcastle disease virus are cytopathic and detection of these strains in cultured cells can be difficult [8]. All strains of Newcastle disease virus will agglutinate chicken red blood cells *in vitro* (and sometimes red blood cells from other species). The process is known as haemagglutination and is the basis of the common serological test, the haemagglutination-inhibition test, used to detect antibodies to this virus [14]. Other serological tests are available.

Different strategies can be implemented to effectively prevent and control the spread of animal diseases at international, national and farm levels and poultry disease control plans often include the use of vaccination. Vaccines are, in fact, an important component of poultry disease prevention and control worldwide. Their use in poultry production is traditionally aimed at avoiding or minimising the emergence of clinical disease at farm level and thus increasing production. Vaccines and vaccination programmes vary widely, depending on several local factors (e.g. type of production, level of biosecurity, local pattern of disease, status of maternal immunity, vaccines available, costs and potential losses). Although poultry vaccination is generally managed by the poultry industry, it has only rarely been applied in the framework of a disease eradication programme at national or regional level to control a few major poultry diseases (e.g. Influenza and Newcastle) [18, 19]. The aim of present study was to compare efficacy of Newcastle disease's live vaccines (Biovac, Clone and LaSota) in broilers using HI method.

MATERIALS AND METHODS

In this survey we used of 1500 broilers from 3 different identical farms. We used Biovac, Clone and LaSota vaccines in farms No. 1, 2 and 3, respectively as dissolved in drinking water on days 8, 22 and 36. All husbandry conditions such as temperature, humidity, chicken's race, light program, ventilation and diet were same in farms and the only difference was type of vaccine. At the end of period, 20 blood samples from each farm were taken. Samples were transferred to the laboratory. In the laboratory, samples were centrifuged and sera were obtained. At the end, HI test was done on sera and antibody levels in the sera were measured. Data were analysed by SPSS software and given in the results section.

RESULTS

On days 8, 22 and 36, the average of titr resulted from Biovac vaccine was 4.1, 2.5 and 1.6, respectively (Table 1).

Data on days 8, 22 and 36 showed that the average of titr resulted from Clone vaccine was 4.3, 2.7 and 1.75, respectively (Table 2).

Also, Data on days 8, 22 and 36 showed that the average of titr resulted from LaSota vaccine was 4.7, 3.4 and 2.4, respectively (Table 3).

By comparison of data, it revealed that there is significant difference between groups from aspect of titr resulted from LaSota and two others ($P<0.05$). Also, data showed that there is no significant difference between groups Clone and Biovac from aspect of titration ($P>0.05$).

Table 1: Titres obtained from Biovac vaccine measured on days 8, 22 and 36

Titr	Log 2	Number of samples on day 8	Number of samples on day 22	Number of samples on day 36
0	0	0	0	6
1	1:2	0	4	3
2	1:4	3	5	5
3	1:8	3	7	4
4	1:16	6	4	2
5	1:32	5	0	0
6	1:64	3	0	0
7	1:128	0	0	0
8	1:256	0	0	0
9	1:512	0	0	0
10	1:1024	0	0	0
11	1:2048	0	0	0
12	1:4096	0	0	0
Min		2	1	0
Max		6	4	4
Mean		4.1	2.5	1.6

Table 2: Titres obtained from Clone vaccine measured on days 8, 22 and 36

Titr	Log 2	Number of samples on day 8	Number of samples on day 22	Number of samples on day 36
0	0	0	0	7
1	1:2	0	5	2
2	1:4	2	4	3
3	1:8	3	6	5
4	1:16	6	2	3
5	1:32	5	3	0
6	1:64	4	0	0
7	1:128	0	0	0
8	1:256	0	0	0
9	1:512	0	0	0
10	1:1024	0	0	0
11	1:2048	0	0	0
12	1:4096	0	0	0
Min		2	1	0
Max		6	5	4
Mean		4.3	2.7	1.75

Table 3: Ttitres obtained from LaSota vaccine measured on days 8, 22 and 36

Titr	Log 2	Number of samples on day 8	Number of samples on day 22	Number of samples on day 36
0	0	0	0	3
1	1:2	0	1	5
2	1:4	0	4	2
3	1:8	5	6	4
4	1:16	3	4	3
5	1:32	5	5	3
6	1:64	7	0	0
7	1:128	0	0	0
8	1:256	0	0	0
9	1:512	0	0	0
10	1:1024	0	0	0
11	1:2048	0	0	0
12	1:4096	0	0	0
Min		3	1	0
Max		6	5	5
Mean		4.7	3.4	2.4

DISCUSSION AND CONCLUSION

The virus of Newcastle disease is very important from financial aspect. Disease losses in most countries, beside of its prevalence is exerting the accurate and principled controlling program that is one of the most costly disease. In some countries the Newcastle disease is endemic thus considered as one of the limiter factors in poultry industry [20]. Epidemiologically, the viruses of Newcastle disease are allocated into five pathotype that velogenic viscerotropic is of most important of them which is caused the digestive form [21]. Because of the existence of hemagglutinin antigen on the Newcastle disease virus capsule, this virus is able to agglutination of red blood cells of some species [22]. Of sub-acute form (velogenic viscerotropic) evidence can be refer to existence of obvious lesions on the proventriculus, cecal tonsils and small intestine which often are hemorrhagic. Thus results in local necrosis on the intestinal membrane. In this study existence of the hemorrhage in the cecal tonsil was also obvious that is compatible with Alexander [23] Study.

Green diarrhea is obvious in most affected birds. Tremors, returning the neck, paralysis of legs and wings and elevated head are of others sings which are reported by Alexander. In this study mentioned sings was also recognized that is consistent with Alexander reports [23].

Vaccination as a mean of protecting birds against ND is routinely practiced in world. Despite extensive use of vaccines, outbreaks of ND are still recorded due to failure to follow an effective cold chain system, required for the maintenance of efficacy of vaccines.

In one study by Bwala *et al*. [24], they showed that no statistically significant difference could be found in the protection offered by Avinew® vaccine against GPMV as compared to RCV challenge. The protection offered against the ND challenge was found to be dose dependent. At the recommended field dose of 106.0 EID50 the vaccine gave 100%protection from mortality against both the challenge viruses, but not against infection and replication of the viruses, as gross lesions were evident even in apparently healthy birds that survived the challenge. The protective dose (PD90) of the Avinew® vaccine against GPMV challenge was calculated at 104.38 and against that of RCV at 104.43.

Mahmud *et al*. [25] found that maternal antibody against NDV in chicks persisted to a minimal until the age of day 27 and none at day 30 or 34. The analysis of HI titres by Student's t-test revealed that Avinew vaccinated group maintained significantly higher HI titres following primary and secondary vaccination as well as during first challenge than that of BCRDV vaccinated group.

In one study by Rehmani Shafqat, in Pakistan, he used LaSota ND vaccine intraocularly ranked the best and Mukteswar vaccine by the drinking water route the worst for their HI antibody titres prior to challenge. He examined the differences between the treatments in protection. He showed that for all three vaccines intraocular vaccine produced higher protection than drinking water vaccine. An inverse relationship between prechallenge and postchallenge HI titres was also recorded [26].

Roy *et al*. [27] demonstrated that three weeks after booster vaccination by oculonasal route, however, the GMT of serum samples were highest followed by feather pulp and tears samples. The ease of collection of feather pulp samples and their role in ND serology is discussed.

Bell *et al*. [28] in a study on comparison of the different vaccines available for controling of Newcastle disease declared that live vaccines are easy to apply and relatively inexpensive and give moderately good immunity. Vaccinal reactions to them vary according to the vaccine strain. Among the live vaccines, the heat resistant vaccines have the significant advantage for village use of easy transportation and they have also been widely used in villages. Recombinant vaccines have the advantage that they can be serologically detected independently of the wild virus [28]. The choice of which vaccine to use is going to depend not only on the preceding factors, but also on the conditions pertaining to a particular region, such as the structure of veterinary services, previous experience, the population distribution, the communication infrastructure and the climate.

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