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308 Lasani Town, Sargodha Road, Faisalabad - Pakistan
Mob: +92 300 3008585, Fax: +92 41 8815544
E-mail: editorijps@gmail.com

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Survey of Newcastle Disease Effects on Broiler Breeder Performance

Adel Feizi[1] and Mehrdad Nazeri[2]
[1]Department of Clinical Science, Tabriz Branch, Islamic Azad University, Tabriz, Iran
[2]Faculty of Veterinary Medicine, Tabriz Branch, Islamic Azad University, Tabriz, Iran

Abstract: Newcastle disease is a serious and commonly fatal disease of chickens caused by a Paramyxovirus. Other avian species are also infected, but usually with less severe consequences. In most developing countries Newcastle disease is the most important infectious disease affecting village chickens. The usual source of infection for village chickens is usually other chickens. The role of other birds as carriers to initiate outbreaks in villages is not well documented. Both epidemic and endemic forms of Newcastle disease occur in village conditions. The aim of this study was to assess the effect of Newcastle disease on broiler breeder performance. In this study, four ND afflicted broiler breeder flocks were selected and the effect of this disease was appraised on these flocks. Of cases studied can be refer the mortality rate, production loss, clinical signs, necropsy signs and disease period. Also in afflicted flocks blood sampling was taken in early and 14 days after of involvement to recording the antibody titer by HI test. Of each saloon number of 16 samples was taken. Samples were referred to lab immediately. In lab, HI test was carried out and antibody titer of ND was measured. It must be noted that race of all flocks was Ross. After sampling from chicks on mentioned days were used of HI method for measurement of serum antibody titer. In this study revealed that antibody titer in before and after N.D has significant difference ($p<0.05$) and antibody titer was increased totally about 2 log after N.D.

Key words: Newcastle disease, broiler breeder, performance

INTRODUCTION

The virus of Newcastle disease is classified within the genus *Paramyxovirus* of the family *Paramyxoviridae* (French *et al*., 1967; Kim *et al*., 2007). 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 (Huchzermeyer, 1993; James, 1991; Kim and Spradbrow, 1978). 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 (Kim and Spradbrow, 1978; Kinde *et al*., 2005; Kinde *et al*., 2004). 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 (Fontanilla *et al*., 1994; Kingston and Dharsana, 1979; OIE, 2007). The infectious virus particle (the virion) will have a lipoprotein envelope that will be essential for infectivity (Arzey, 2005; Kingston and Dharsana, 1977; Ministry of Agriculture, Fisheries and Food, 1974). 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 (Arzey, 2005; Fontanilla *et al*., 1994). 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 (Groves, 2003; Johnston, 1990; OIE, 2002).

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 (Kaleta and Baldouf, 1988; Rubite, 2003; OIE, 2004). 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 of the host cells, a process termed cytopathogenicity (French *et al*., 1967; Kaleta and Baldouf, 1988). Not all strains of Newcastle disease virus are cytopathic and detection of these strains in cultured cells can be difficult (Fontanilla *et al*., 1994). 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 (Groves, 2003). Other serological tests are available.

Corresponding Author: Adel Feizi, Department of Clinical Science, Tabriz Branch, Islamic Azad University, Tabriz, Iran

MATERIALS AND METHODS

Vaccination program of flock was as follow:

Age of vaccination	Type of vaccine and route of administration
1 day old	H_{120} (spray)
10 days old	AI + ND (MI) + clone (eye drop)
12 days old	Bronchitis vaccine 4.91 (drinking water)
16 days old	D_{78} (drinking water)
24 days old	Clone (drinking water)
27 days old	D_{78} (drinking water)
39 days old	D_{78} (drinking water)
42 days old	MS (eye drop)
48 days old	Clone (drinking water)
11 weeks old	Clone (drinking water)
14 weeks old	Pox + coryza + Reo (injection) + ILT (eye drop)
15 weeks old	AE (drinking water))
17 weeks old	Clone (drinking water)
18 weeks old	Quadric vaccine (ND + IB + coryza + EDS)(MI) + pox (wing) + influenza (SC) + dual vaccine (Reo + IBD) (injection)

In this study, four ND afflicted broiler breeder flocks were selected and the effect of this disease was appraised on these flocks. Of cases studied can be refer the mortality rate, production loss, clinical signs, necropsy signs and disease period. Also in afflicted flocks blood sampling was taken in early and 14 days after of involvement to recording the antibody titer by HI test. Of each saloon number of 16 samples was taken. Samples were referred to lab immediately. In lab, HI test was carried out and antibody titer of ND was measured. It must be noted that race of all flocks was Ross. After sampling from chicks on mentioned days were used of HI method to measurement of serum antibody titer.

RESULTS

Comparison of obtained results from measurement of antibody titer in understudying farms before administration of killed vaccine on 18 weeks old: Related data are shown in Table 1.

Comparison of obtained results from measurement of antibody titer in understudying farms 25 days after administration of the killed vaccine: Related data are shown in Table 2 and statistical data are shown in Table 3.

From comparison of the antibody titer aspect in before and after administration of killed vaccine, there is a significant difference ($p<0.05$) and antibody titer was increased totally about 0.5 log.

Comparison of obtained data from measurement of antibody titer on understudying farms at onset of the clinical signs: Related data are shown in Table 4.

Comparison of obtained data from measurement of antibody titer on understudying farms 2 weeks after beginning of the clinical signs: Related data are shown in Table 5 and statistical data related to occurrence to Newcastle disease are shown in Table 6.

From comparison of the antibody titer aspect in before and after N.D, there is a significant difference ($p<0.05$) and antibody titer was increased totally about 2 log after N.D.

Comparison of obtained data from measurement of mortality rate in the understudying farms: Related data obtained from t-test are shown in Table 7.

From mortality aspect and comparison of obtained data between two groups it has been revealed that there is a significant difference among two groups ($p<0.05$). Also demonstrated that mortality rate in afflicted flock was 17.79 times more than standard flock.

DISCUSSION

The virus of Newcastle disease is very important from financial aspect. Disease losses in most countries,

Table 1: Maximum, minimum and mean of antibody titer from understudying farms before administration of killed vaccine

Antibody titer	Log2 titre	Bleeding time: before administration the killed vaccine															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	1:2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	1:4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	1:8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4	1:16	-	-	-	-	-	-	-	-	-	-	-	-	6	-	-	2
5	1:32	-	-	-	-	-	-	-	-	2	2	4	4	4	4	6	4
6	1:64	6	4	8	6	2	-	6	2	8	10	6	8	6	2	6	6
7	1:128	8	10	8	8	6	12	8	6	6	2	4	2	-	8	4	4
8	1:256	2	2	-	2	8	2	2	6	-	2	2	2	-	2	-	-
9	1:512	-	-	-	-	-	2	-	2	-	-	-	-	-	-	-	-
10	1:1024	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	1:2048	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	1:4096	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Min		6	6	6	6	6	7	6	6	5	5	5	5	4	5	5	4
Max		8	8	7	8	8	9	8	9	7	8	8	8	6	8	7	7
Mean		6.7	6.8	6.5	6.7	7.3	7.3	6.7	7.5	6.2	6.2	6.2	6.1	5.3	6.2	5.8	5.7

Table 2: Maximum, minimum and mean of antibody titer from understudying farms 25 days after administration of killed vaccine

Antibody titer	Log2 tirte	Bleeding time: 25 days after administration the killed vaccine															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	1:2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	1:4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	1:8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4	1:16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	1:32	-	-	-	-	-	-	-	-	-	-	-	2	8	-	2	2
6	1:64	3	2	3	3	-	-	4	-	8	8	2	10	8	6	6	8
7	1:128	6	7	9	7	6	7	6	5	4	5	12	4	-	8	6	6
8	1:256	7	7	4	6	8	5	4	6	4	3	2	-	-	2	2	-
9	1:512	-	-	-	-	2	4	2	5	-	-	-	-	-	-	-	-
10	1:1024	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	1:2048	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	1:4096	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Min		6	6	6	6	7	7	6	7	6	6	6	5	5	6	5	5
Max		8	8	8	8	9	9	9	9	8	8	8	7	6	8	8	7
Mean		7.25	7.31	7.06	7.18	7.75	7.81	7.25	8	6.75	6.68	7	6.1	6.5	6.7	6.5	6.2

Table 3: Data obtained from before and after administration of killed vaccine

	Group	Mean±SEM	SD	p-value
Antibody titer	Before administration	6.54±0.06	1.06	0.001
	After administration	6.59±0.06	0.96	

Table 4: Maximum, minimum and mean of antibody titer from understudying farms at onset of the clinical signs

Antibody titer	Log2 titre	Bleeding time: onset of the clinical signs															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	1:2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	1:4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	1:8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4	1:16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	1:32	-	-	-	-	-	-	-	-	-	2	8	-	6	-	-	-
6	1:64	2	-	4	-	-	4	2	8	8	10	6	6	6	2	6	2
7	1:128	-	-	2	8	6	6	6	4	6	2	2	6	4	8	8	6
8	1:256	2	8	-	4	4	2	4	2	2	2	-	4	-	6	2	2
9	1:512	2	4	6	2	2	2	2	2	-	-	-	-	-	-	-	2
10	1:1024	8	2	4	2	2	2	2	-	-	-	-	-	-	-	-	4
11	1:2048	2	2	-	-	2	-	-	-	-	-	-	-	-	-	-	-
12	1:4096	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Min		6	8	6	7	7	6	6	6	6	5	5	6	5	6	6	6
Max		11	11	10	10	11	10	10	9	8	8	7	8	7	8	8	10
Mean		9.2	8.8	8.2	7.8	8.3	7.5	7.6	6.7	6.62	6.25	6.6	6.8	5.8	7.2	6.7	8

Table 5: Maximum, minimum and mean of antibody titer from understudying farms 2 weeks after beginning of the clinical signs

Antibody titer	Log2 titre	Bleeding time: 2 weeks after beginning of the clinical signs															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	1:2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	1:4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	1:8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4	1:16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	1:32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	1:64	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7	1:128	-	3	3	5	2	4	2	1	6	4	2	3	4	2	4	5
8	1:256	2	4	2	4	4	3	3	4	-	3	3	3	3	5	4	2
9	1:512	6	1	4	1	3	3	4	2	4	3	2	2	3	3	3	4
10	1:1024	1	5	4	3	3	2	2	4	1	1	4	4	3	2	3	5
11	1:2048	7	3	3	3	4	4	5	5	5	5	5	4	3	4	2	-
12	1:4096	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Min		8	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
Max		11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	10
Mean		9.73	8.93	9	8.53	9.06	8.86	9.2	9.4	8.8	8.86	9.33	9.06	8.73	8.93	8.53	8.6

Table 6: Statistical data obtained from before and after Newcastle disease

	Group	Mean±SEM	SD	p-value
Antibody titer	Onset of the N.D	7.36±0.09	1.48	0.001
	2 weeks after N.D	9.08±0.09	1.45	

Table 7: Mortality rate in two groups

	Group	Mean±SEM	SD	p-value
Mortality rate	Standard flock	8	-	0.001
	Treatment group	25.79±1.96	7.84	

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 (Lana *et al*., 1988). 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 (Alexander *et al*., 2008). 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 (Wilden *et al*., 2009). 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 *et al*. (2008) 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 (2001). In this study mentioned sings was also recognized that is consistent with Alexander reports (Alexander, 2001). Finally it can be conclude that Newcastle disease is one of the fatal disease and based on our research results the mean of production losses was 4% that has significant difference than standards ranges ($p<0.05$) and must be take measures in this field.

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