

Detection of Newcastle disease virus antibodies in serum of broiler chickens of Iran

A. Ghaniei*¹, N. Mohammadzadeh¹

¹Department of clinical science, faculty of veterinary medicine, Urmia University

Abstract

Newcastle disease (ND) is a common problem in poultry farms of Iran. Several serological and molecular tools are applied to diagnose the infection and predict its effects. Hemagglutination inhibition (HI) is a serologic test that commonly used in diagnostic laboratories. In order to determine NDV antibody status in broiler flocks of West and East Azarbayjan at the end of rearing period, 383 blood samples collected from 2 slaughterhouses in West Azarbayjan and subjected to HI test. 40.6% of samples were positive for NDV antibodies. High prevalence of NDV infections in poultry flocks indicates that present applied strategies are not fully effective in the case of this infection. Biosecurity measures, vaccination programs and surveillance are altogether effective strategies in prevention of infection.

Keywords: Newcastle disease, HI, Iran.

*Corresponding author: Tel: +98(441) 2774737
Email address: A.Ghanieizarch@urmia.ac.ir

Introduction

Newcastle disease (ND) is one of the most important infectious diseases of poultry. Newcastle disease virus (NDV) is synonymous with avian paramyxovirus type 1 and infects over 200 bird species (Alexandr and Senne, 2008a). NDVs are classified into velogenic, mesogenic, and lentogenic strains based on their pathogenicity in chicken (Beard and Hanson, 1984). NDV infections range from asymptomatic to rapidly fatal (Alexandr and Senne, 2008a). Different strategies were applied to lessen spread of virus and economical losses of the infection. Orajaka et al., reported vaccination as the only safe option in control strategies of infection (Orajaka et al., 1999). In Iran, live and killed vaccines are used for protection of broiler flocks against disease. The best method for diagnosis of the disease is isolation and characterization of agent. Serological tests are useful tools in diagnosis of infection. Hemagglutination inhibition (HI) test is the most commonly used test for detection of immune response in affected birds (Alexandr and Senne, 2008b). Value of serology in diagnosis of disease depends on vaccination history of birds and on prevailing disease conditions (OIE Terrestrial Manual 2012).

In this survey, we collected 383 blood samples of broilers in 2 abattoirs of west Azarbayjan to determine antibody titers of flocks against Newcastle disease virus. Result of such surveys is beneficial to predict value of this infection and its impact on broiler flocks of Iran.

Material and methods

383 blood samples were collected from 2 abattoirs of West Azarbayjan (north- west of Iran). 25 broiler flocks were included in this survey. Flocks were in West Azarbayjan and East Azarbayjan provinces (16 flocks in West Azarbayjan and 9 flocks in East Azarbayjan). Serum obtained by centrifugation of samples and subjected to HI test according to protocol (OIE Terrestrial Manual 2012). Briefly, two-fold serial dilutions of sera were made and 4HA Newcastle disease virus with equal volume (25 µl) of diluted sera was used in each well of 96 well microplate. After 45 minutes incubation at room temperature, 25 µl 1% chicken RBC was added and after 30 min incubation at room temperature, the last well which had a complete inhibition, was considered as the antibody titre. Statistical analysis was carried out using SPSS version 16.0 (SPSS, Chicago, IL, USA) where applicable.

Results & Discussion

309 out of the 383 collected broiler sera were positive for NDV antibodies in HI test (table 1). Mean antibody titre for NDV was 5.31. There was no significant difference in mean NDV HI titre between East Azarbayjan province and West Azarbayjan ($P < 0.05$). Samples of West Azarbayjan divided into north and south, based on their geographic locations. There is a significant difference between mean titre of north and south samples ($P < 0.05$). Mean AIV titre in cities of north of west Azarbayjan was 5.57, whereas 4.43 in south.

Newcastle disease is a viral infection of poultry which causes huge losses in industry. Clinical manifestations of disease vary among different isolated, but respiratory distress, diarrhea, nervous signs, and egg production drop can be noted (Miller et al., 2010). Several outbreaks of virulent strains have been reported throughout world, and these strains are endemic in many countries including in Asia and Africa (Miller et al., 2010).

In this survey, we collected 383 blood samples from birds to determine prevalence of NDV antibodies in their serum. 19.3% of birds were negative and had HI titre 2-3 and lower. 65.5% of birds had $2^{-4} \leq \text{HI titre} \leq 2^{-7}$. This group may be vaccinated with commercially available vaccines. So, history of vaccination program is important in interpretation of results. Differentiation between vaccinetitre and field challenge is difficult. Third group of birds had HI titre 2^{-8} and higher. These high HI titres imply infection with pathogenic field strains. High percentage of positive birds in this study indicates that ND is a common respiratory disease of flocks of Iran. So, preventive measures must be applied in every poultry farm. NDV vaccines are commonly used in poultry farms of Iran. But, incidence of ND in vaccinated flocks may be due to inadequate vaccination practices (Dortmans et al., 2012) or biosecurity faults.

Table1. HI results of collected serums.

Antibody titre	$<2^{-4}$	2^{-4}	2^{-5}	2^{-6}	2^{-7}	2^{-8}	2^{-9}	2^{-10}
Number (percentage)	184(59.4%)	49(15.8%)	39(12.6%)	15(4.8%)	11(3.5%)	7(2.3%)	4(1.3%)	1(0.3%)

Note: sera with titres $\geq 2^{-4}$ were considered positive.

Rezaeianzadeh and coworkers conducted a survey on NDV prevalence in village chickens of Fars province using molecular and serological tests. Results showed that chickens in 13 villages (61.9%) were seropositive, but all of RT-PCR results were negative (Rezaeianzadeh et al., 2011). Hadipour (2009) examined 350 blood samples of backyard chickens for NDV antibodies. He stated that 37.56% of samples were positive, and mean HI titre was 5.21. In another study on village chickens in Iraq, 46% and 34.4% were seropositive by ELISA and HI test, respectively (Aziz & Ahmed., 2010). 180 native chickens were examined by HI test for NDV antibodies and had $2-3 \leq \text{HI titre} \leq 2-7$ (Oyekunle et al., 2006). Kite et al., reported that 300 out of 753 surveyed farms throughout Australia were positive for NDV infection (Kite et al., 2007). In another report from Bangladesh, 78.04% samples of broilers and 96.67% of layers were positive for NDV antibodies (Mozaffor Hossain K.M., 2010).

Newcastle disease is caused by avian paramyxovirus type 1 (APM-1). Other serotypes of avian paramyxoviruses are also important in epidemiology of disease. Other serotypes, especially APMV-3 decrease susceptibility of birds to NDV infection and disease (Nayak et al., 2012). So, such serotypes must be included in monitoring programs.

Newcastle disease is a devastating disease in poultry production. Strict regulations must be applied in infected areas. According to the results of present study and previous ones, Newcastle disease is common in Iran. Biosecurity rules, vaccination and surveillance can prevent the introduction of such infection and reduce its economic losses.

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