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A Serological Survey for Newcastle Disease Virus Antibodies in Backyard Chickens Around Maharlou Lake in Iran

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Abstract: A seroprevalence survey was carried out in villages around Maharlou lake using Haemagglutination Inhibition (HI) tests for NDV antibodies in backyard chickens. Survey region has a distance of <30 km to the Shiraz (Capital of Fars province). Distance between this lake and the nearest-neighbour poultry farm was <1 km. The sampled chickens had not been vaccinated and had no clinical signs of disease. The mean antibody titer was found 5.47, 6.35, 4.48, 5.23, 4.52 and seroprevalence was 40.9, 48.36, 30.2, 35.7 and 32.64% in 5 villages. The overall antibody titer and seroprevalence of Newcastle disease virus was recorded 5.21 and 37.56%, respectively.

Key words: Serology, newcastle, backyard chickens, maharlou lake

INTRODUCTION

Newcastle disease virus is a negative-stranded RNA virus of the family Paramyxoviridae. Newcastle Disease (ND) is a viral disease of domestic poultry and wild birds characterized by gastrointestinal, respiratory and neurological signs. Newcastle-Disease Virus (NDV) infections of poultry range from inapparent to rapidly fatal depending upon the pathotype of virus involved (Alexander, 2003). In countries where poultry are kept exclusively in birdproof housing, the ability of feral birds to invade affected flocks and transfer the disease will be minimal, whereas birds kept on open range are more likely to be infected with strains carried by feral birds (Wobeser *et al*., 1993; Onapa *et al*., 2006). Backyard chickens throughout the world especially in Middle East countries play an important role in people nutrition due to meat and egg production. Maharlou lake has a distance of <30 km to the Shiraz (Capital of Fars province). Different types of birds migrate to this lake. Close contact of these birds with backyard chickens resulting in transmission of infectious agents such as Newcastle disease virus but little is known about the disease status of backyard poultry, so the aim of this study, was to serological evidence of exposure of the backyard chickens to Newcastle disease virus by hemagglutination inhibition test.

MATERIALS AND METHODS

Serum samples and HI assay: A total of 350 blood samples were randomly collected from the wing vein of backyard chickens (unvaccinated, mature and healthy chickens) belonging to 5 villages (from each village 70 blood samples were collected) aound Maharlou lake (Fig. 1). Samples were maintained at room temperature and transported to the testing laboratory within 24 h. If a delay in transport of samples was expected, samples were held for 24 h and then the serum decanted and the serum samples frozen at -20°C prior to laboratory submission. Antibodies to NDV present in the serum samples were detected using the haemagglutination inhibition assay as described in the Standard Diagnostic Test for ND (Della-Porta and Spencer, 1993).

Fig. 1: Map of the geographic regions of the Newcastle disease survey

Samples were classed as seronegative if all samples had titres of <1: 8 and <50% of samples reacted at 1: 4. A flock, from which any sample reacted at a titre of >1: 8 or, from which three or more samples (out of 15) reacted at a titre of 1: 8 was considered to be positive.

RESULTS

Results of the investigation revealed that all the villages had chickens that were positive for antibodies to Newcastle Disease Virus (NDV). The mean antibody titer of NDV in backyard chickens sera was found 5.47, 6.35, 4.48, 5.23, 4.52 and seroprevalence was 40.9, 48.36, 30.2, 35.7 and 32.64% in 5 villages. The overall antibody titer and seroprevalence of Newcastle disease virus was recorded 5.21 and 37.56%, respectively. No significant difference ($p>0.05$) was seen in NDV antibody titer and seroprevalence of NDV between 5 villages, but in each village between different samples there was significant difference ($p<0.05$).

DISCUSSION

In the present study, in each village the NDV antibody titer was found in the range of zero to 10 $\log_2$ HI ($p<0.05$). This could be due to non-intensive rearing system in backyard chickens that resulting in different stages of infection in these chickens.

Identification of distance to neighbouring poultry farms as a risk factor in our study is consistent with Alexander (2003) who listed airborne spread as one mechanism for the spread of NDV. This mechanism was considered a significant factor in the 1970-1971 ND outbreaks in England (Hugh-Jones *et al*., 1973).

The results of an serological study was conducted by Maminiaina *et al*. (2007) showed that the Newcastle disease, responsible for 44.3% of all the mortality recorded during the 12 month period (from May 1999 to June 2000) in village poultry farming in Madagascar and maximum incidence of the disease was 71% and seroprevalence often reached 100% after the outbreak had ended. The infection was brought to the villages either by newly introduced hens or recovered birds. All forms of Newcastle disease (epidemic, endemic and asymptomatic) were observed. The way farmers reacted contributed to the spread of the virus within a village and to neighbouring locations. In our study, the movement of people, vehicles and fomites between industrial neighbouring poultry farms and villages is another risk factor for transmission of NDV to backyard (Village) chickens and vice versa (Alexander, 2003). Age of the sampled chickens was another risk factor in our study, because the prevalence of seropositive samples and the average backyard chickens anti-NDV antibody titre increased with increasing chicken age (East *et al*., 2006). In the study areas, the backyard chickens were reared under semi-scavenging system and were allowed to scavenge with ducks in the yard, in the crop fields near to water reservoirs where domestic ducks, wild ducks and migratory birds used to scavenge over there. This factor may contribute in natural infection to the backyard chickens. Epidemiological study of Newcastle disease in backyard poultry and wild bird populations in Switzerland suggests that buying eggs or poultry abroad and exchanging poultry within the country were factors, more important than wild birds, to explain the higher NDV seropositivity in pure-bred poultry flocks (Gohm *et al*., 1999). In a cross-sectional survey of Australian chicken farms to identify risk factors associated with seropositivity to Newcastle-disease virus, the overall prevalence of NDV seropositive farms was 39.8% (East *et al*., 2006). In another serological and virological survey for evidence of infection with Newcastle disease virus in Australian chicken farms, antibody evidence of Newcastle disease virus infection was found on 300 of the 753 surveyed farms throughout all 11 geographic regions of the survey. Antibody titres were also highest in the regions where serologically positive flocks were most prevalent and concluded that the antibodies to Newcastle disease virus are highly prevalent in the Australian chicken flock but all identified strains were avirulent in nature (Kite *et al*., 2007).

In a serological survey, was carried out in village area in Niger, the incidence of Newcastle disease was 14% in non vaccinated and 63% in vaccinated local hens (Courtecuisse *et al*., 1990).

A seroprevalence survey in backyard (free-range) village chickens in 30 villages from Mexico using Haemagglutination Inhibition (HI) tests showed that the seroprevalences were 2.2% for NDV antibodies (Gutierrez-Ruiz *et al*., 2000).

CONCLUSION

We demonstrated that the risk of backyard chicken flocks being seropositive for NDV increased with increasing age of the flock, increasing proximity to the nearest-neighbour poultry farm and presence of wild and migratory birds in the vicinity of the backyard chicken flocks.

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