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ROLE OF FREE LIVING BIRDS AS RESERVOIRS OF NEWCASTLE DISEASE VIRUS INFECTION

[1]M. Geetha*, [2]L. Gunaseelan, [3]P.I. Ganesan and [4]K. Kumanan and [5]G. Selvaraju
[1]Assistant Professor, [5]Associate Professor
Department of Veterinary Epidemiology and Preventive Medicine,
Veterinary College and Research Institute, Namakkal. 637002, Tamil Nadu, India
[2]Professor and Head,
Department of Veterinary Public Health and Epidemiology,
Madras Veterinary College, Chennai. 600 007, Tamil Nadu, India
[3]Professor and Head,
Department of Veterinary Epidemiology and Preventive Medicine,
Madras Veterinary College, Vepery, Chennai. 600 007, Tamil Nadu, India
[4]Director of Research,
Tamil Nadu Veterinary and Animal Sciences University,
Chennai. 600 051, Tamil Nadu, India
[5]Associate Professor,
Department of Veterinary Epidemiology and Preventive Medicine,
Veterinary College and Research Institute, Namakkal. 637002, Tamil Nadu, India
E-mail: drmgeetha@gmail.com (**Corresponding Author*)

Abstract: Newcastle disease (ND) is one of the major viral diseases of poultry causing great economic losses to the poultry industry. This study was aimed to assess the epidemiological role of free living birds in the transmission of ND. A total of 63 cloacal swabs/droppings from various categories of free living birds (desi chicken, pigeon, turkeys, crows, sparrows, geese, parrots) were collected and inoculated into specific pathogen free embryonated chicken eggs for isolation of Newcastle disease virus (NDV). Four NDV isolates were obtained out of 63 cloacal swabs inoculated and the isolates were characterized as velogenic and lentogenic pathotypes based on mean death time (MDT) and intracerebral pathogenicity index (ICPI). It is concluded that free living birds may play an important role in the transmission of NDV to domestic chicken and enforce the biosecurity measures to minimize the effective contact between them.
Keywords: Newcastle disease, free living birds, pathotypes.

INTRODUCTION

Newcastle disease remains a constant threat to the poultry industry and is a limiting disease for poultry producers worldwide (Cattoli *et al.*, 2011). It may represent a bigger drain on the world economy than any other animal viral disease of poultry (Alexander, 2003).

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Apart from commercial poultry, a wide range of captive and free living birds are susceptible and can act as primary source of ND infection to chicken (Kouwenhoven, 1993; Alexander and Senne, 2008). Limited work has been done to know the role of free living birds like desi chicken, caged pet birds, turkeys, geese, pigeons, sparrows, crows etc. in the spread of the ND to commercial chicken (Raghavan *et al.*, 1998). Hence, this study is aimed to assess the role of free living birds in the spread of ND.

MATERIALS AND METHODS

A total number of 63 cloacal swabs/droppings from various categories of free living birds (Table – 1) were collected in phosphate buffered saline at Chennai, Tamil Nadu, India, and centrifuged at 1500 g for 15 minutes at 4^{o}C. The supernatant was treated with penicillin at the rate of 10,000 IU/ml and of streptomycin at the rate of 10mg/ml used for virus isolation. Virus isolation, identification and characterization were carried out by the procedures described by Alexander and Senne (2008). The supernatants of cloacal swabs were inoculated into 9-10 day old specific pathogen free embryonated chicken eggs through allantoic cavity route and incubated at 37^{o}C. Those embryos died within 24 hours after inoculation was considered as non-specific and those embryos that died after 24 hours were chilled. Amnio-allantoic fluid (AAF) collected from the dead embryos were subjected to haemagglutination (HA) test with 1% washed chicken erythrocytes and all the dead embryos were examined for the presence of characteristic NDV lesions. The AAF samples which were not agglutinating chicken erythrocytes at first passage were subjected to two more blind passages in embryonated eggs. Spot HA test was carried out at each passage level and the samples which showed the HA activity were confirmed by haemagglutination inhibition (HI) test by using specific NDV antiserum raised at the Department of Animal Biotechnology, Madras Veterinary College, Chennai. The viral isolates were characterized by mean death time (MDT) in specific pathogen free embryonated chicken eggs and intracerebral pathogenicity index (ICPI) in day old chicks.

RESULTS AND DISCUSSION

Out of the 63 number of cloacal swabs from free living birds inoculated into the embryonated chicken eggs, four samples (Desi chicken, pigeon, sparrow and crow) yielded NDV isolates with per cent positivity of 6.35%. Time of death of embryos, corresponding HA titre of AAF, reciprocal HI titre, ICPI and MDT values are given in Table – 1.

The viral isolates from desi chicken, pigeon, crows and sparrows had ICPI value of 1.68, 1.975, 0.00 and 0.003 respectively. As per Werner *et al.* (1999), NDV with ICPI value of

above 1.5 are considered as velogenic and lentogenic viruses have ICPI value of below 0.7. Hence isolates obtained from desi chicken and pigeon were of velogenic pathotype and isolates obtained from crows and sparrows were of lentogenic pathotype. Mean death time of the NDV isolates obtained in this study varied from 64 hours to 114 hours. Even though MDT was considered as an important tool in characterizing different isolates, it has been reported to be imprecise particularly when used to characterize isolates from hosts other than chicken (Alexander, 1988).

Newcastle disease virus isolates obtained in this study is a classical reminder that any free living and caged birds can act as natural reservoirs of NDV and strengthens the explanation of Hanson and Spalatin (1978) that the apparent emergence of ND as highly pathogenic disease of poultry was possible because NDV in its virulent form was enzootic in some other species in which it produced the disease or an unrecognized disease. Takakuwa *et al*. (1998) reported that a wide variety of pathogenic NDV strains are maintained in nature. Newcastle disease viruses of low virulence are hypothesized to give rise to virulent viruses by mutations and it is not clear whether such mutations takes place in free living birds reservoirs or are introduced into chickens and then mutate. The lack of virulent isolates from free living pigeons and crows indicted that the latter is more likely (Alexander, 2003). An earlier report by Alexander and Parsons (1986) has indicated that increase of virulence of NDV isolates from other poultry when passaged in chickens. Such possibilities caution the importance of free living birds as NDV reservoirs. Identification of NDV isolates in this study is evidence of the need for continuous characterization of NDV strains of all pathotypes which will provide a better understanding of the diversity that exists as suggested by King and Seal (1997). Single stranded RNA viruses which lack of proof reading and post replicative error correction mechanisms are expected to have high mutation rate and therefore to evolve rapidly (Koonin and Dolja, 1993). Immune system of the birds may force the virus to evolve more rapidly in order to create escape mutants, which in turn might lead to the emergence of a few mutants and avoid clearance by the hosts immune system and such mutants have the ability to spread widely and cause epidemics in chickens (Ke *et al.*, 2001).

CONCLUSION

Hence in this scenario, biosecurity measures should be strictly enforced to minimize the contact of domestic poultry with free living birds for preventing the spread of NDV.

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Table – 1
Details of virus isolation from cloacal swabs/droppings of free living birds

Bird	No. of samples inoculated	Isolates obtained	Passage level	HA titre of AAF	HI titre reciprocal of serum dilution	ICPI	MDT
Desi chicken	22	1	III	512	64	1.68	64
Pigeon	9	1	III	64	32	1.975	72
Turkeys	3	-	-	-	-	-	-
Crows	10	1	III	64	128	0.00	92
Sparrows	16	1	II	256	128	0.03	114
Geese	2	-	-	-	-	-	-