Original Research

Seroprevalence of Avian Reovirus Infection in Apparently Healthy Adult Commercial Layer Flocks*

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**Part of PhD Research submitted to P. V. Narsimha Rao Telangana Veterinary University, Telangana State, India*

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Rec. Date:	Feb 02, 2019 06:20
Accept Date:	Jun 28, 2019 14:11
DOI	10.5455/ijlr.20190202062036

Abstract

In order to study the seroprevalence of ARV, a total of 103 sera samples from apparently healthy adult CL flocks unvaccinated against ARV were collected from ten different flocks between December 2016 and August 2018. To study the seroprevalence more closely among the different age group, the birds were categorised into layer/ production group I (21 to 40 weeks), layer/ production group II (40 to 60 weeks) and layer/ production group III (60 weeks and above). Seroprevalence of ARV infection was assessed by ELISA (Idexx Laboratories, USA; Kit no. 99-09264) kit. Out of 103 sera samples, 102 sera samples (99.03%) were positive for ARV antibodies. Age wise seroprevalence of ARV antibodies in different age groups was carried out. All the sera samples were positive in the birds of group 1 (20-40 weeks age) and III (60 weeks and above age) with mean titre of 3640 and 2534, respectively. A total of 97.5 per cent sera samples were positive for ARV in the birds of group II (40 to 60-week age) with mean titre of 3852. The present study indicated widespread prevalence of ARV infection in apparently healthy CL flocks and could be due to nonpathogenic to low pathogenic ARV strain.

Key words: Avian reovirus, Commercial layer, Flocks, Seroprevalence, ELISA

How to cite: Sawale, G., Lakshman, M., Raut, S., Bulbule, N., Chawak, M., Madhuri, D., & Reddy, Y. (2019). Seroprevalence of Avian Reovirus Infection in Apparently Healthy Adult Commercial Layer Flocks. International Journal of Livestock Research, 9(8), 172-176. doi: 10.5455/ijlr.20190202062036

Introduction

The avian reoviruses (ARV) are members of the Orth reovirus genus in the family Reoviridae. The name reovirus derives from the acronym for respiratory enteric orphan because they were first isolated from these

sites in humans with initially no apparent association with disease. Reovirus infections are prevalent worldwide in chickens, turkeys and other avian species and involves in a variety of disease conditions in domestic poultry of which the most important disease is viral arthritis/tenosynovitis in chickens (Jones, 2013). Tenosynovitis/ viral arthritis has been considered to be a major cause of leg weakness in meat-type chickens (Jones, 2013). The importance of reovirus infections throughout the world varies widely from region to region (Jones, 2013). The ARV infection although rare in light breed birds (layer) but has been reported by Schwartz *et al*. (1976). Although, ARV have been implicated as important cause of lameness in broiler parents, its studies in commercial layer (CL) flocks appears to be scanty in literature. Hence, present study was planned to investigate the seroprevalence of ARV in apparently healthy adult CL flocks. The seroprevalence of ARV in broiler parents has been reported in Iran (Bokaie *et al.*, 2008), Turkey (Erol and Şengul, 2012), Canada (Ayalew *et al*., 2017), Pakistan (Hussain *et al.*, 1990) and India (Kataria, 1985 and Baksi *et al.*, 2018). Seroprevalence of ARV in different commercial poultry flocks was reported by Pu *et al*. (2008) in CL flocks (92%), Nham (2013) in broiler chicken (91%) and Salam *et al.* (2015) in CL and BP flocks with a variable proportion of positivity.

Materials and Methods

In total, 103 sera samples from apparently healthy adult CL flocks were collected between December 2016 and August 2018 and used for seroprevalence study. The birds of the flocks investigated were apparently healthy and did not show any signs and symptoms of ARV infection. Ten to twelve serum samples from each flock were collected in the present study. None of the flocks used for seroprevalence study had a history of vaccination against ARV. The aim of this exercise was to know the broader scenario of ARV in apparently healthy adult CL flocks. In order to study the seroprevalence more closely among the different age group, the birds were categorised into layer/ production group I (21 to 40 weeks), layer/ production group II (40 to 60 weeks) and layer/ production group III (60 weeks and above).

Seroprevalence of avian reovirus infection was assessed by avian reovirus antibody test ELISA (Idexx Laboratories, USA; Kit no. 99-09264) kit. The test was performed according to manufacturer's instruction and the mean titers, the cut-off point of 396 (S/P ratio greater than 0.20) and above were considered positive as specified in the Idexx guide.

Results and Discussion

Seroprevalence of ARV infection in ten different apparently healthy adult CL flocks with mean titre, titre range, standard deviation (SD) and coefficient of variation (CV) were presented in Table 1.

DOI 10.5455/ijlr.20190202062036

Table 1: Seroprevalence of ARV in apparently healthy adult CL flocks

S. No.	Farm Code	Age (wks.)	No. of Sample Tested	Per cent Positive	Titer Range	Titer Mean	SD	CV	SE of Mean
C-1: Layer flocks-group I (20-40 wks.)									
1	CL-12	27.2	10	100 (10/10)	3096-7210	5251	1287	24.5	429
2	CL-13	32	10	100 (10/10)	1152-6948	3910	1912	48.9	637
3	CL-14	38	10	100 (10/10)	468-4672	1760	1253	71.2	417
C-1: Subtotal-layer flocks-group I			**30**	**100 (30/30)**	**468-7210**	**3640**	**2088**	**57.4**	**388**
C-2: Layer birds-group II (40-60 wks.)									
4	CL-15	45.6	10	100 (10/10)	1396-3163	2320	527	22.7	175
5	CL-16	49.3	10	100 (10/10)	1327-7721	3387	2071	61.1	690
6	CL-17	53	10	90 (09/10)	76-7657	6185	2123	34.3	707
7	CL-18	58	10	100 (10/10)	1493-7586	3516	1722	49	574
C-2: Subtotal -layer flocks-group II			**40**	**97.5 (39/40)**	**76-7721**	**3852**	**2245**	**58.3**	**360**
C-3: Layer birds-group III (60 wks. and above)									
8	CL-19	60.2	12	100 (12/12)	504-1751	1160	357	30.8	107
9	CL-20	65	10	100 (10/10)	809-3797	1725	926	53.7	308
10	CL-21	87	11	100 (11/11)	2270-6584	4768	1265	26.5	399
C-3: Subtotal layer flocks-group III			**33**	**100 (33/33)**	**504-6584**	**2534**	**1840**	**72.6**	**325**
Total (C-1+C-2+C-3)			**103**	**99.03 (102/103)**	**76-7721**	**3368**	**2156**	**64**	**213**

Figures in bracket indicates – No. of ARV positive sera / total no. of sera tested

A total of 103 sera samples were collected from 10 different adult layer flocks out of which 102 sera samples (99.03%) were positive for ARV antibodies. The overall mean titre, titre range and CV from adult layer flock was 3368, 76 to 7721 and 64, respectively. Age wise seroprevalence of ARV antibodies in different age groups was carried out (Table 1). Thirty sera samples from three-layer flocks of 20 to 40-week age group (group I) were tested for ARV antibodies. All the sera samples (100% *i.e.* 30 out of 30 sera samples) were positive for ARV antibodies. The lowest titre was 468 and the highest titre was 7210 with a mean titre of 3640 from the group I layer flocks. The CV of this flock was 57.4.

A total of 97.5 per cent sera samples *i.e.* 39 sera samples out of 40 sera samples from four-layer flocks of 40 to 60-week age group (Group II) were positive for ARV antibodies with the lowest titre of 76 and highest titre of 7721. The mean titre was 3852 with a CV of 58.3 in layer group II. A total of 100 per cent sera samples *i.e.* 33 out of 33 sera samples from three-layer poultry flocks of 60 weeks and above age group (Group III) were positive for ARV antibodies. The mean titre, titre range and CV from layer group III was 2534, 504 to 6584 and 72.6, respectively. The studies on seroprevalence of ARV in the present investigation are in close agreement with the reports on seroprevalence in Iran (98.3%) by Bokaie *et al.* (2008), in Turkey (70.6% to 77.2%) by Erol and Şengul (2012), in Canada (98.3%) by Ayalew *et al*. (2017), and higher than the prevalence reported in India (8.67%) by Baksi *et al.* (2018) and Pakistan (3.33%) by Hussain *et al.* (1990). A very high seroprevalence of ARV with high mean titres was also reported by Pu *et al*. (2008) in

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CL flocks (92%), Nham (2013) in broiler chicken (91%) and Salam *et al*. (2015) in CL and BP flocks with a variable proportion of positive titres.

In the present study, neither the ARV virus was detected by polymerase chain reaction nor virus isolated in cell culture in any of the ten-flock investigated. However, the flocks considered under this investigation were unvaccinated against ARV. Thus, the birds from these flock may have been exposed to ARV of low virulence during their lifetime as suggested by De Herdt *et al*. (1999) who studied reovirus serology in BP and their progeny in Belgium and its correlation with performance. In their study, the BP that were not vaccinated with the live vaccine developed humoral antibodies against reovirus. The clinical signs were not observed in these flocks. The study indicated that a low virulence reovirus strains may be circulating among the Belgium poultry. Similar to our study, Erol and Şengul (2012) also did not notice any signs of disease in older birds probably because they had higher antibody titres and fully developed immune systems.

The present study indicated that the most of the apparently healthy adult CL birds showed higher mean titre with a higher percentage of positive birds for ARV antibodies indicating that the birds are exposed to natural ARV infection. Similarly, earlier serological and experimental pathological studies on avian orthoreovirus revealed that the virus is ubiquitous and most of the strains of avian reovirus cause asymptomatic infection in poultry (Ide and Dewitt, 1979; De Herdt *et al*., 1999; Van der Heide, 2000 & Jones, 2013). Moreover, the ELISA (IDEXX Laboratories, USA) kit plates are coated with a whole virus lysate and the kit is not strain specific and detects a wide range of pathogenic and nonpathogenic strains, therefore antibody level and disease are not directly associated (Ayalew *et al*., 2017).

Conclusion

In conclusion, the ARV infection appears to be ubiquitous in poultry and the widespread prevalence of ARV in in apparently healthy CL flocks could be due to strains of nonpathogenic to low pathogenic ARV that might have caused asymptomatic infection in poultry.

Acknowledgments

The first author is thankful to World Poultry Science Association India Branch for granting Padmashree B. V. Rao research grant for this study.

References

1. Ayalew, L. E., Gupta, A., Fricke, J., Ahmed, K. A., Popowich, S., Lockerbie, B., Tikoo, S. K., Ojkic, D. & Gomis, S. (2017). Phenotypic, genotypic and antigenic characterization of emerging avian reoviruses isolated from clinical cases of arthritis in broilers in Saskatchewan, Canada. *Scientific Reports*, 7 (1), 3565.
2. Baksi, S., Rao, N., Chauhan, P. & Chauhan, A. (2018). Sero-prevalence of avian reovirus in broiler breeders in different parts of India. *PSM Veterinary Research*, 3 (2), 22-25.

DOI 10.5455/ijlr.20190202062036

3. Bokaie, S., Shojadoost, B., Pourbakhsh, S. A., Pourseyyed, S. M. and Sharifi, L. (2008). Seroprevalence survey on reovirus infection of broiler chickens in Tehran province. *Iranian Journal of Veterinary Research*, 9, 181-183.
4. De Herdt, P., Ducatelle, R., Uyttebroek, E., Hermans, J., Sneep, A. & Torbeyns, R. (1999). Reovirus serology in broiler parents and their progeny and its correlation with performance. *Avian Diseases*, 43 (2), 271-278.
5. Erol, N. and Şengul, S. S. (2012). Seroprevalence of avian reovirus infections in chickens in western provinces of Turkey. *Kafkas Üniversitesi Veteriner Fakültesi Dergisi*, 18, 653–656.
6. Hussain, Z., Hanif, W. and Naz, S. (1990). Prevalence of reovirus infection in poultry. Proc. 3rd Int. Congress Pakistan Veterinary Medical Association, November, 28-29.
7. Ide, P. R. and Dewitt, W. (1979). Serological incidence of avian reovirus infection in broiler-breeders and progeny in Nova Scotia. *The Canadian Veterinary Journal*, 20 (12), 348-353.
8. Jones, R. C. (2013). Reovirus infections – Viral Arthritis. *In:* Diseases of Poultry 13th ed, Iowa State University Press, Ames, pp 352-361.
9. Kataria, J. M. (1985). Studies and characterization of agents associated with infectious arthritis of poultry with special emphasis on viral arthritis. Ph. D. thesis submitted to Rohilkhand University.
10. Nham, E. (2013). An epidemiological investigation of avian reovirus among commercial broiler chicken flocks in Ontario. A Thesis presented to the University of Guelph in partial fulfilment of requirements for the degree of Master of Science in Population Medicine.
11. Pu, J., Liu, X., Guo, Y., Cao, Y., Zhao, J. and Zhang, G. (2008). Seroprevalence of avian reovirus in egg-laying chicken flocks in China. *Avian Diseases*, 52 (4), 675-679.
12. Salam, A., Haque, M. A., Rahman, M. M., Akter, M. R. and Afroz, F. (2015). Detection of avian reovirus antibodies in layer birds of small-scale commercial farms in Dinajpur district of Bangladesh. *Asian Journal of Medical & Biological Research*, 1 (3), 612-621.
13. Schwartz, L. D., Gentry, R. F., Rothenbacher, H. & van der Heide, L. (1976). Infectious tenosynovitis in commercial white leghorn chickens. *Avian Diseases*. 20, 769-773.
14. Van der Heide, L. (2000). The history of avian reovirus. *Avian Disease*, 44, 638-641.

DOI 10.5455/ijlr.20190202062036