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Serological Survey on the Prevalence of Chicken Infectious Anemia Virus in Commercial Broiler Chicken Flocks in Northern Jordan

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Abstract: Chicken Infectious Anemia Virus (CIAV) is a resistant and ubiquitous virus causing disease in young chickens and immunosuppression in all birds. CIAV infection in broiler chicken flocks has been described in most countries with a developed chicken industry and can result in economically important losses either clinical or subclinical form of the disease in broiler chickens. In this study 414 sera samples from 32 commercial broiler chickens flocks located in Northern Jordan, were tested for the presence of CIAV antibodies using a commercial enzyme linked immunosorbent assay kit. Overall seroprevalence in broiler chicken populations was 82.61%. The rate of antibody-positive chickens among flock's samples ranged from 38.5% to 100%. The seropositive samples were more obvious in older chickens. This is the first report of serologic evidence of CIAV in Northern Jordan. According to these results, the disease can probably be found throughout the country and beyond. Therefore further studies are necessary to assess economic losses due to CIAV and the cost benefit of countermeasures.

Key words: Chicken infectious anemia Virus, Immunosuppression, broiler

Introduction

Chicken Infectious Anemia (CIA) is a viral infection in poultry caused by Chicken Infectious Anemia Virus (CIAV), a single-stranded DNA virus with icosahedral symmetry belonging to the family *Circoviridae* (Fenner *et al.*, 1993). The CIAV was first described by (Yuasa *et al.*, 1979). The disease is transmitted both vertically (Chettle *et al.*, 1989; Jorgensen, 1991), and horizontally (Hopp *et al.*, 1992; Schat, 2003). CIAV infection in broiler chicken flocks has been described in most countries with a developed chicken industry and can result in economically important losses either clinical or subclinical form of disease in broiler chickens (McNulty *et al.*, 1991; Yuasa and Imai, 1986). The virus is important because of its potential for inducing immunosuppression alone or in combination with other infectious agents like infectious bursal disease. CIAV infections are manifested by either clinical or subclinical signs (Schat, 2003). Serological data has suggested that CIAV appeared to be ubiquitous in all major chicken producing countries of the world. The virus was isolated from chickens in Japan, China, Australia, New Zealand, and South Africa (Schat, 2003) but there is no published paper about its prevalence in Jordan. This paper describes the serologic prevalence of chicken infectious anemia virus in commercial broiler chicken flocks in Northern Jordan between November 2005 to March 2006 and the association of seropositivity with flock age.

Materials and Methods

The flocks: A prospective study to survey for the presence of CAV antibodies in commercial broiler chicken flocks between November 2005 to March 2006 in the Northern area of Jordan, was conducted by collecting 414 blood samples from (n = 32) broiler chicken flocks that ranged in age from 1-43 days. Flocks were sampled only once and the number of blood samples were between (10-12) for flocks (size = 4000) and (13-17) for flocks (size = 6000). A total population (156000) of broiler chickens was distributed over the (n = 32) commercial broiler farms in Northern Jordan, which followed an open-house system. The stocking density was 10 birds / m^2. The birds are housed in an intensive deep-litter system. No clinical signs or post-mortem lesions suggestive of CIA were observed in any of the flocks.

Sampling: All the broiler farms (n = 32) in the Northern part of Jordan were contacted through the appropriate veterinarians and all owners agreed to participate in this study. Each farm was visited once and questionnaires were filled. Then, blood samples were collected by veno-puncture of the wing vein. Sera were separated and stored at -20^0 until used. Commercial broiler chicken flocks in Jordan had not been vaccinated against CAV.

Enzyme-linked immusorbent assay (ELISA): A commercial test kit was used to detected specific antibodies against CIAV based on indirect enzyme linked immunosobent assay (Synbiotics Corporation, ProFlock KPL. USA). A serum dilution of 1:50 was used following the instructions of the manufacturer. Optical density value was read at 405 nm wave length on an ELx800 ELISA reader (BIO-TEK Instruments, Inc. Winooski, VT, USA). Positive and negative control antisera were provided in the kit and used in each run.

Table 1: Seroprevalence of chicken anemia infectious virus in commercial broiler chicken flocks in Northern Jordan

Flock ID	Age (Days)	Flock size tested	No. of birds	No. of Positive birds	Seropre-valence (%)	GMT titres	Mean	SD
1282	32	4000	11	11	100	4410	4735	1722
1283	4	4000	11	11	100	4089	4355	1603
1290	31	4000	10	10	100	3734	3911	1242
1291	36	4000	11	11	100	5133	5389	1829
1330	28	6000	17	15	88.2	1487	3697	1926
1336	24	6000	16	13	81.3	868	2672	1830
1348	20	6000	14	7	50	53	1437	1510
1355	34	4000	11	10	90.9	1567	3275	1942
1356	32	4000	10	10	100	1754	4042	2529
1367	27	4000	12	9	75	320	1716	1206
1368	35	4000	12	11	91.2	2113	4052	2310
1369	2	4000	11	11	100	4121	4562	2093
1370	3	4000	12	12	100	3668	3904	1293
1378	26	6000	14	7	50	56	1862	2597
1380	3	6000	15	13	86.7	1145	3213	1916
1386	4	4000	11	11	100	4066	4658	2816
1389	12	4000	12	6	50	45	1054	1161
1400	2	4000	12	12	100	4249	4524	1567
1402	25	6000	13	5	38.5	19	810	1137
1419	32	6000	15	7	46.7	37	1149	1430
1420	27	6000	15	9	60	116	1868	2066
1425	42	4000	12	10	83.3	644	2066	1276
1426	22	4000	12	5	41.7	28	1324	1693
1431	36	4000	12	11	91.2	2624	5990	4484
1432	37	6000	17	15	88.2	1986	5487	4190
1433	2	4000	12	11	91.2	2208	4365	2188
1436	2	6000	15	14	93.3	2680	4546	1917
1437	1	6000	15	15	100	5287	5534	1666
1441	43	6000	13	10	76.9	459	2458	2045
1447	46	6000	13	13	100	6775	7429	3611
1479	1	6000	16	16	100	4795	4848	702
1489	4	4000	12	11	91.2	2039	3856	1584
Total		156000	414	342	82.61	72575	114788	63081

GMT = Geometric Mean Tier; SD = Standard Deviation

Statistically: The correlation of age (in days) and rate of seropositivity was analyzed by the Linear Regression Test. While the relationship between ages and mean titer was analyzed by Pearson Correlation Test. All of the analyses were performed with the SAS 8.2 package (SAS Institute, 1999)

Results and Discussion

CAV infection was widespread in commercial broiler chicken flocks in Northern Jordan. All flocks were found to be positive to CAV at all ages. Overall seroprevalence in broiler chicken populations was 82.61%. The rate of antibody-positive chickens among flocks ranged from 38.5% to 100%. The minimum and maximum means and GMT (Geometric Mean Titer) were ranged between (810-7429) and (19-6775) respectively (Table 1). The results provide evidence a of widespread distribution of the virus and of a considerably high incidence of infection among poultry commercial broiler flocks in Northern Jordan, as it has similarly been documented to occur worldwide in all major poultry producing countries as describe previously (Cardona *et al.,* 2000). CIAV seroprevalence in chickens has been reported to be high in many countries. For example, CIAV seroprevalence was 87.7% in broiler chicken flocks in Shahrekord, Iran (Mahzounieh *et al.,* 2005), and 86% in commercial chicken flocks in Nigeria (Owoade *et al.,* 2004).

The presences of high mean titres in 1-4 days old chicks in this study are due to the presence of maternal antibodies. This is interesting, since chicks from such breeders are probably protected during their first week of life by maternally derived antibodies. (Otaki *et al.,* 1987) showed that maternal antibodies protect against infection of young chicks when hens are infected well before the onset of lay. (McConnell *et al.,* 1993 and Toro *et al.,* 1997) show that infection of chickens older than 2 weeks, although considered subclinical, has immunosuppressive effects, which are likely to result in increased susceptibility to the diseases caused by other infectious agents. (McNulty *et al.,* 1988) reported that subclinical infections of commercial broilers might result in increased mortality and condemnations.

There were no significant relationships between the age

and mean titers in this study in the correlation table by Pearson Correlation Test (P > 0.050). The power of Linear Regression Test, for the correlation of age (days) and rate of seropositivity (0.502) is below the desired power of (0.800), so it is interpreted as the negative finding. Our results showed that CIAV is ubiquitous and infects all poultry flocks, at least in Northern Jordan, and it may be an important cause of immunosuppression in chickens. Rearing losses in poultry flocks are high in Jordan and caused by a number of pathogens. The results of our investigations showed that chicken anemia is yet another one of them. Further studies are necessary to assess the economic losses due to CIAV and the cost benefit of countermeasures. Indeed, farmers need to be instructed about the signs and importance of CIAV.

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