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Biochemical Parameters in Broiler Chickens Vaccinated Against ND, IB and IBD

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Abstract: Poultry diseases affect serum values of some biochemical parameters in chickens and a high degree of correlation between serum concentration of these parameters and humoral immunity against some poultry diseases has been reported. During this investigation, effects of vaccination against Newcastle disease, infectious bronchitis and infectious bursal disease on some selected biochemical parameters including albumin, calcium, chloride, cholesterol, glucose, magnesium, phosphorus, protein and triglycerides were studied. The results indicate that differences in values of the biochemical parameters within chickens of various ages were significant ($P<0.05$), while between chickens of each group at specific age were not significant. Comparison values of the biochemical parameters between groups revealed that only values of triglyceride, total protein and albumin of vaccinated chickens were significantly ($P<0.05$) differed from those values of corresponding biochemical parameters of control chickens. In conclusion, serum concentrations of biochemical parameters are age-dependent and some of them differ by vaccination.

Key words: Arbor-Acres, broiler, serum biochemistry, IB, ND, IBD

Introduction

Blood analyses have been performed much less often in avian medicine in comparison to its routine use in large animal practices in veterinary medicine. Serum biochemical parameters may provide valuable information for differential diagnosis of nutritional disorders (Quintavalla *et al*., 2001), anti-toxic effects of probiotic (Aqawane and Lonkar, 2004) and evaluation of health status of birds (Kral and Suchy, 2000). Biochemical values of chicken's serum may be influenced by several factors including poultry diseases (Panigrahy *et al*., 1986; Koinarski *et al*., 2001; Burnham *et al*., 2003; Kumar *et al*., 2003), Feed additives (Oguz *et al*., 2000; Cetin *et al*., 2002), some dietary nutrients (Odunsi *et al*., 1999; Eroksuz *et al*., 2001; Al-Homidan *et al*., 2002; Kurtoglu *et al*., 2005), some drugs (Zaman *et al*., 1995), housing systems (Gunes *et al*., 2002), environmental temperature (Vecerek *et al*., 2002), and water restrictions (Iheukwumere and Herbert, 2003). Nutritional status of a host and in particular, highly bioavailable forms of zinc (Kidd *et al*., 1996) affect immune functions. Supplementation of zinc together with manganese amino acid complexes in broiler diets increase humoral immunity against Newcastle disease (ND), infectious bronchitis (IB) and infectious bursal disease (IBD) (Khajarern *et al*., 2002). A high correlation between antibody titers of Newcastle disease and serum concentration of calcium has also been reported (Bozickovic *et al*., 2000). The aim of this study was to compare values of some selected serum biochemical parameters in control and vaccinated broiler chickens against ND, IB and IBD.

Materials and Methods

Chickens: Forty day-old chicks of Arbor-Acres broiler strain were divided into two groups (C and V) with 20 chicks in each. The chicks were housed in cages, kept in separate rooms with recommended ambient temperature and other environmental conditions, and fed *ad libitum* with diets fully met the requirements laid down in the technical instructions for this strain.

Vaccination of chicks in group V: The chicks of group V were vaccinated with live vaccines (IBV H120, IBD D78, and ND B1 vaccines) routinely used for prevention of broilers against three major viral poultry diseases (infectious bronchitis, infectious bursal disease, and Newcastle disease, respectively). Eye-drop route of vaccination was used in this study. Vaccination program was designed as day 0 with H120, day 9 with B1, day 14 with D78, day 18 with H120, day 21 with B1, and day 25 with D78 vaccines according to recommendation of local Veterinary Bureau.

Blood sampling: On day 0, half of the chicks of each group (C and V) were bled as previously described (Olorede and Longe, 1999) in order to prepare blood samples of day 0 for chicks of group C (control) and V (eye-drop vaccinated). On day 7, blood samples were collected from jugular veins using 1 ml insulin syringes with 25 gauge needles, on day 14 and at weekly intervals until 56 days old, blood samples were collected from brachial vein as described (Zander, 1997; Alcorn, 2002). Blood samples were labeled according to leg-number of chickens and day of bleeding. In order to minimize biochemical parameters changes, sera were immediately separated and centrifuged 2300g for 5 minutes as recommended (Hrubec *et al*., 2004).

Table 1: Values of biochemical parameters of broiler (V=vaccinated & C=control) chickens during husbandry period (Mean±SEM)

Age (day)	Group	Calcium (mg/dl)	Chloride (meq/l)	Cholesterol (mg/dl)	Glucose (mg/dl)	Magnesium (mg/dl)	Phosphorous (mg/dl)	Triglycerides (mg/dl)	Total Protein (mg/dl)	Albumin (mg/dl)
0	C	4.64±0.35	108.9±1.5	362.1±2.72	267.6±6.7	1.650±.0.05	3.54±0.22	71.90±5.32	2.42±0.12	0.66±0.04
	V	4.64±0.35	108±1.59	362.8±2.54	267±6.7	1.65±0.05	3.52±0.22	70.9±5.12	2.39±0.05	0.67±0.05
7	C	8.21±0.53	102.8±2.4	103.9±3.78	393.5±2.45	2.03±0.20	6.3±0.16	133.1±9.94	2.26±0.27	1.74±0.06
	V	8.21±0.53	102.8±2.4	102.8±3.85	373.1±1.5	2.07±0.15	6.3±0.16	130.9±4.52	2.0±0.10	1.7±0.08
14	C	9.29±0.37	109.0±0.9	143.7±2.07	312.3±3.41	2.45±0.08	5.07±0.15	133.7±9.43	2.37±0.10	1.71±0.12
	V	8.32±0.1	113.7±0.7	142.4±4.58	377±1.38	1.65±0.13	5.49±0.17	177.0±8.09	2.29±0.09	1.18±0.06
21	C	9.73±0.36	100±2.4	127.4±4.8	293.0±3.68	1.70±0.05	5.03±0.15	88.90±8.52	2.42± 0.15	1.50±0.1
	V	8.68±0.42	101.6±0.4	126.8±4.76	311.1±7.12	1.78±0.08	5.15±0.22	133.0±6.82	2.31±0.17	1.20±0.05
28	C	9.98±0.29	102±1.5	118.1±5.0	290.2±4.28	1.90±0.11	5.39±0.16	63.6±5.23	2.42± 0.07	1.64±0.04
	V	8.71±0.54	108.7±1.2	128.7±6.92	289.2±1.0	1.83±0.04	5.46±0.26	102.6±3.62	2.35±0.21	1.35±0.11
35	C	8.24±0.38	106.3±2.7	134.4±5.57	258.5±3.6	1.94±0.18	6.8±0.29	60.2±3.25	2.76±0.13	1.63±0.08
	V	7.82±0.32	111.7±0.6	169.4±5.05	301.7±8.4	2.20±0.11	5.90±0.21	105.5±5.25	2.52±0.11	1.44±0.07
42	C	7.42±0.43	105.6±0.8	134.9±8.6	243.1±6.3	1.68±0.07	6.55±0.15	52.4±2.48	3.86±0.19	1.7±0.07
	V	7.21±0.32	110.2±1.6	143±1.06	301.1±9.91	2.03±0.04	5.91±0.14	88.3±7.76	3.6±0.11	1.35±0.05
49	C	7.09±0.22	102.7±0.8	134.3±5.1	233.8±4.28	1.78±0.3	5.39±0.17	47.7±0.71	3.83±0.14	1.57±0.12
	V	7.13±0.3	102.8±0.5	122.9±4.73	233.8±2.7	2.16±0.09	5.25±0.12	86.3±3.14	3.79±0.14	1.44±0.05
56	C	7.00±0.18	145.6±7.6	121.7±4.2	282.8±3.22	2.03±0.44	4.21±0.32	47.6±3.32	4.18±0.22	1.88±0.05
	V	7.19±0.25	138.9±7.7	126.3±3.26	313±8.5	1.65±0.03	4.4±0.29	60.0±4.93	4.11±0.11	1.76±0.06
Ave.	C	7.95±0.55	109.3±4.6	153.38±26.37	286.0±15.8	1.91±0.08	5.36±0.37	77.67±11.37	2.93±0.25	1.55±0.11
	V	7.56±0.41	111±3.77	158.34±26.26	307.4±15.2	1.89±0.07	5.26±0.28	106.4±12.04	2.81±0.26	1.34±0.1

Biochemical parameters values determination: Serum biochemical parameters values were determined by using an auto-analyzer spectophotometer (Technicon RA 1000^{TM}, Hartwell, LA, USA) and different kits in various wavelengths as follow;

Albumin: Serum albumin concentration was determined as mg/dl by using Pars-Azmun kits with the bromcresol green method at 546 nm wavelength.

Calcium: Serum calcium concentration was determined as mg/dl by using Pars-Azmun kits with cresol phthalein complex method at 550-590 nm wavelengths.

Chloride: Serum chloride concentration was determined as meq/l by using Pars-Azmun kits with chem. Enzyme method at 500-550 nm wavelengths.

Cholesterol: Serum cholesterol concentration was determined as mg/dl by using Pars-Azmun kits with chod-pap method at 546 nm wavelength.

Glucose: Serum glucose concentration was determined as mg/dl by using Pars-Azmun kits with god-pap method at 500-546 nm wavelengths.

Magnesium: Serum glucose concentration was determined as mg/dl by using Pars-Azmun kits with xylidyn-blue test at 500 nm wavelength.

Phosphorus: Serum phosphorus concentration was determined as mg/dl by using Pars-Azmun kits with UV method at 340 nm wavelength.

Triglyceride: Serum triglyceride concentration was determined as mg/dl by using Pars-Azmun kits with gpo-pap enzymatic method at 546 nm wavelength.

Total Protein: Serum total protein concentration was determined as mg/dl by using Pars-Azmun kits with Biuret method at 540-546 nm wavelengths.

Statistical analysis: Repeated measure ANOVA and Bunfrony tests from SPSS 11 were used for statistical analysis of the results. Relationship between age and values of biochemical parameters as well as age and titers of immune responses were ascertained by means of Pearson's correlation coefficient test.

Results

The results of this study, as shown in Table 1, revealed that physiological values of all the biochemical parameters in one-day-old chicks of both groups (values derived from yolk) were differed from those of husbandry period. Values for cholesterol on day 0 in both groups were nearly three times of those in husbandry period, while values of other biochemical parameters were much lower than those in during husbandry period (Table 1).

Comparison of values of triglyceride, total protein and albumin for vaccinated group with values of corresponding parameters for control chickens were significantly ($P<0.005$) differed, while the differences between values of the rest biochemical parameters were not significant. Levels of anti-body titers for control and vaccinated chickens were shown in Fig. 1-3 indicating that after reduction of maternal antibodies for ND, IB and IBD, antibodies against these diseases were not detectable in chickens of control group, whereas vaccinated chickens show high titers of antibody titers in different levels based on the vaccination program.

Discussion

In avian medicine, interpretation and sensible utilization of blood profiles are often limited by lack of values for

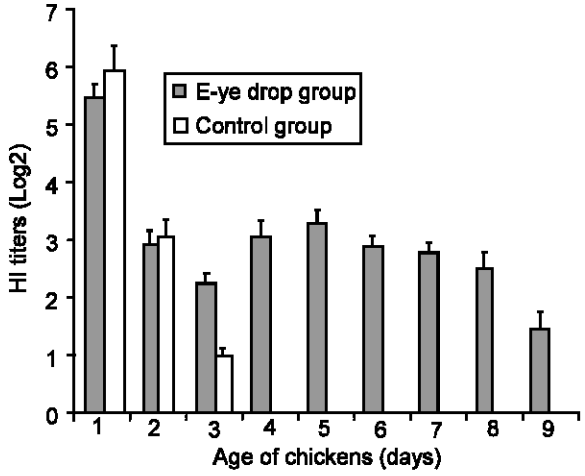

Fig 1: ND HI titers of vaccinated and control chickens

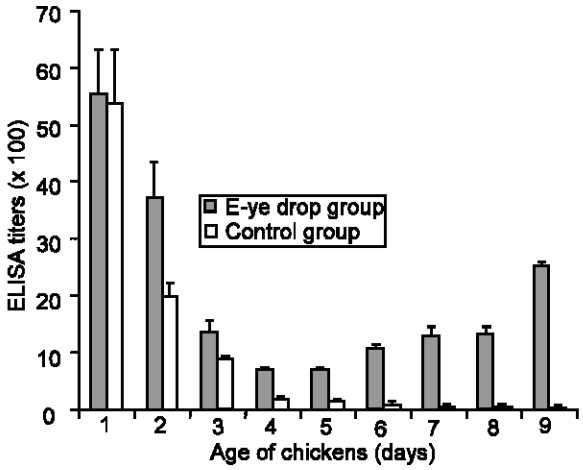

Fig 2: IB Elisa titers of vaccinated and control chickens

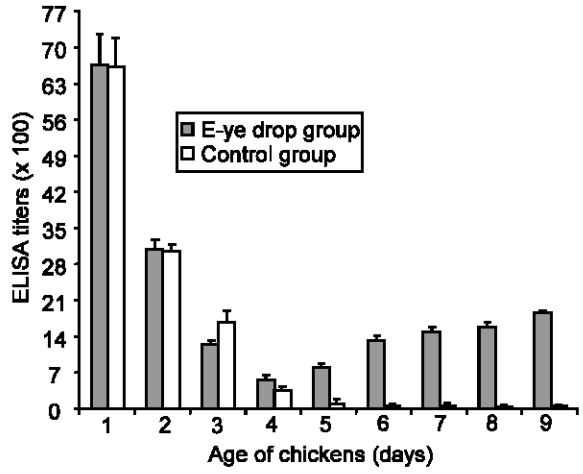

Fig 3: IBD Elisa titers of vaccinated and control chickens

physiological parameters relevant to the individual avian species and in each species to breeding lines, production types, and etc (Kral and Suchy, 2000). Comparison of reported values for biochemical parameters among different species of bird including ostrich (Mushi *et al*., 1998), captive birds (Polo *et al*., 1998), Sea-birds (Work, 1996), and broiler strains (Qaisar *et al*., 1996), indicates that biochemical parameters values of birds are species-dependent and significant differences between plasma and serum values have also been reported (Hrubec *et al*., 2004).

The results of this study revealed that values of the biochemical parameters studied were not differed significantly within chickens of same-age during 8 weeks husbandry period, but the differences in values of those biochemical parameters were significant ($P<0.05$) among chickens of different age in both vaccinated and control groups. The significant differences among serum concentrations most of the biochemical parameters at various age of husbandry period observed in this study is in agreement with previous reports that values of some biochemical parameters are age-dependent (Selvaraj *et al*., 1998; Krasnodebska-Depta and Andrej, 2000).

Comparison of biochemical parameters values observed in this study for Arbor-Acres as a genetically-improved strain of broiler chickens with those of previously reported for indigenous fowls (Naziefy-Habibabadi, 1997; Simaraks *et al*., 2004) revealed that there are big differences on serum concentrations of the biochemical parameters. As some of the biochemical parameters affect the out-come of immune responses against some poultry diseases, therefore our data may provide some useful information in regards to selection of genetically-improved-resistance strains for poultry industry. For example, serum calcium concentration affects immune responses and antibody titers of Newcastle disease are dependent on serum calcium concentration (Bozickovic *et al*., 2000). Comparison of serum calcium concentrations of various strains of chickens indicate that serum calcium concentration is significantly higher in Hubbard than in Lohman, and Arbor-Acres strains (Qaisar *et al*., 1996) and serum calcium concentration observed in this study for Arbor-Acres strain (7.95±0.55) was less than of those reported for indigenous (10.3±0.8 for male and 10.1±1.5 for female) chickens (Simaraks *et al*., 2004) and single-comb white leghorn (10.03±0.43) chickens (Hrubec *et al*., 2004).

Conclusion: The results of this experiment indicate that the serum concentrations of biochemical parameters are age-dependent and some serum biochemistry values of vaccinated broiler chickens differ significantly from those of unvaccinated chickens.

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