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Effect of Various Factors in Blood Parameters of Laying Hens in Cages Indoor Grown in Afyonkarahisar

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Abstract

This study was carried out in five hundred Hy Line breed chickens at the 60 days age breeding in Afyonkarahisar Province. This study was done during the winter season when the outside temperature was 13 °C, while the average indoor temperature of the shelters was 23°C. Clinical, hematological and blood biochemical parameters were measured in chickens that constituted the study material. Clinically; body temperature (T), respiration (R) and heart rates (P) were measured. In the hematological examinations; formula leukocyte counts were performed with erythrocyte (RBC), total leukocyte (WBC), hemoglobin (HB), hematocrit (HCT), mean corpuscular volume (MCV), mean erythrocyte hemoglobin (MCH) and mean hemoglobin concentration (MCHC). In the blood biochemical examinations; serum aspartate aminotransferase (AST), serum gamma-glutamyltransferase (GGT), ornithine carbamoyltransferase (OCT), serum lactate dehydrogenase (LDH), serum sorbitol dehydrogenase (SDH) and creatine phosphokinase (CPK), total protein (TP), Albumin (ALB), Glucose (GLU), Total and Indirect Bilirubin (TB and IB), Total Cholesterol (TCOL), High Density Lipoprotein (HDL) and Low Density Lipoprotein (LDL) levels were determined. At the end of the study; it has been observed that all of the measured parameters differ from the results obtained from earlier studies, although those within the normal limits. The probable cause of this variability was linked to changes in race, nutritional and climatic conditions. The results obtained from the study were the first to examined clinical, hematological and blood biochemical parameters in chickens breeding in closed cages in Afyonkarahisar Province, and then to reference the field studies of scientific studies and practicing veterinarians to study about this subject.

Keywords: Chicken; Clinical; Hematological; Blood biochemistry

Introduction

The world population will increase by 33% by 2050, which is predicted to lead to a 70% increase in total food production [1], leading to an increase in poultry meat and egg demand. Chicken meat and protein derived from eggs is the cheapest source of meat for human consumption, the United Nations Food and Agriculture Organization (FAO), behind the pig of the poultry world population is ranked as the second largest source of protein [2]. However, the commercial poultry industry, infection that can affect productivity negatively, is faced with stress factors such as feed variations and climate change [3,4]. Indeed, the poultry growth performance is not only inherited, but is also greatly influenced by the surrounding [5]. Stress directly affects the physiology and well-being of poultry and results in a lower rate of return [6,7].

Among the most common stress factors in cage-type poultry farming are; temperature, humidity, lack of light, hosting crowd, ventilation, noise and fear, infection, vaccination and transport are to count [8-10]. Many physiological and metabolic activities are formed in response to stress events, which may result in pathological changes in hematological and serum biochemical parameters [11].

In this study; it was aimed to present the first case of important stress, hematological and biochemical parameters for internal diseases in chickens grown in modern facilities.

Materials and Methods

Animal material

The material of this work was the 500 Hy-Line raki 60-day-old egg chickens grown with closed cage system in Afyonkarahisar Province. The study was carried out in winter and the average temperature of the plants was measured at 23°C. It was determined that the plant was kept at these temperatures continuously during the winter season and the same rations were given to the animals and they were grown under the same conditions in the same scaled cages, the calculation continued with the calculation of the arithmetic mean (AO) of the parameters being measured.

This study has been carried out with the reference number of AKUHADYEK 344-16 under the ethics rules of Afyon Kocatepe University Animal Experiments Ethics Committee and it was supported by the reference number of 17.SEGBIL.16 and Afyon Kocatepe University Scientific Research Projects Coordination Unit (BAPK).

Methods

Clinical experiments: Body temperature, nostril observation, auskultation, respiration and heart rate were measured by cloacaal route and animals were recorded to be evaluated.

Hematological measurements: In animals, blood was drawn into EDTA blood tubes via brachial ven so that it would not exceed 1% of live weight, blood samples were sent to the laboratory within the same day and as soon as possible. In blood samples taken for hematological examination; (RBC), total leukocyte (WBC), hematocrit (HCT), hemoglobin (HB), mean corpuscular volume (MCV), mean corpuscular hemoglobin (MHC), mean corpuscular hemoglobin concentration (MCHC), lymphocyte (LENF), neutrophil Hematological examinations such as NOTR, eosinophil (EOS), monocyte (MON) and basophil (BAZ) were measured using commercial test kits with a Chemray Brand blood count device.

Serum biochemical measurements: For this purpose, sera of the blood samples taken at the site were taken out and the extracted sera were stored at +4°C by taking gods if not immediately measured. In blood biochemical examinations; Serum aspartate aminotransferase (AST), serum gamma glutamyltransferase (GGT), ornithyl carbomyl transferase (OCT), serum lactate dehydrogenase (LDH), serum sorbitol dehydrogenase (SDH) (spectrophotometrically measured at 340nm wavelength on a Chemwell Mark device) (TPL), albumin (ALB), glucose (GLU), total and indirect bilirubin (TB and IB), total cholesterol (TCOL), high density lipoprotein (HDL) and low density lipoprotein) Were determined using commercial kits in the Chemwell Brand autoanalyser.

Statistical analyses

The existence of similar stress factors in all of the animals that make up the material of the study, the lack of significant differences in terms of the stress parameters among the birds, and the similarity of the projects, ration, altitude, (AO) (Yildiz et al. 2002), the results of some studies considered nominal in terms of the previously mentioned parameters are not available levels were found to be appropriate.

Results

In our present study, the temperature measured during the inspection and inspection at the enterprises was determined as 23°C, but there was no possibility to measure the humidity during this operation. The facilities are built according to European standards and this includes stress, such as the presence of sufficient light and ventilation requirements, the fact that indoor climate conditions are prevalent, animals are raised in crowded places, the high temperature due to the crowd in special areas, The presence of factors has been identified. As a matter of fact, it was observed that around 30 animals were housed in a section of 20 animals during the study.

Clinical findings

In our current study, the AOs of body temperature, respiration, and heart rates and the lowest and highest values of the animals in the material forming are shown in Table 1.

Table 1: The lowest and highest levels of body temperature, heart and respiratory freaks in animals were obtained with AOs.

Values	T (○C)	P (freq/min)	R (freq/min)
AO	40.05	274	44.5
ED-EY	39.4-40.7	230-318	34-55

Hematological findings

The AOs of the hematological parameters measured for the animals forming the material and their lowest and highest levels are shown in Table 2.

Table 2: Measured hematological parameters.

Values	T (○C)	P (freq/min)	R (freq/min)
AO	40.05	274	44.5
ED-EY	39.4-40.7	230-318	34-55

Values	LENF (%)	NOTR (%)	EOS (%)	MON (%)	BAS (%)
AO	57.5	27	4.5	7	2
ED-EY	42-73	15-39	7-Feb	11-Mar	3-Jan

AO: Arithmetic mean, ED-EY: Low-highest values

Serum biochemical findings

Blood biochemical analysis endpoint AOs measured in this study and the lowest and highest measured values are shown in Table 3.

Table 3: Hayvanların Kan Biyokimyasal Analizleri.

Values	TP (g/dl)	ALB (g/dl	GLU (mg/dL)	TB (nmol/L)	IB (nmol/L)	TCOL (mg/dL)	HDL (mg/dL)	LDL (mg/dL)	AST (IU/L)	GGT (IU/L)	LDH (IU/L)	CK (IU/L)	SDH (IU/L)
AO	3.96	1.74	243	0.005	-	138.5	27.71	74.345	251.25	18.7	1147.35	2651.35	0.026
ED-EY	2.62-5.30	1.14-2.34	126-360	0-0.01	-	78-199	21.82-33.6	62.39-86.3	164.5-338	10-27.4	960.5-1334.2	1870.4-3432.3	0.019-0.033

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Discussion

Stress is the name given to all of the biochemical, physiological and behavioral changes that occur in the body in order to restore the distorted hemostatic balances of animals exposed to the factors [12]. It has been reported in studies conducted in animals exposed to hunger and transport stress that the sympatho-adrenal system is stimulated in stress cases, which causes an increase in body temperature, respiration and cardiac fre- quency (Srikandakumar and Johnson) [13]. It has also been pointed out that the increase in body temperature in homothermic animals in hot and humid conditions is expected [14,15]. In this study, we found that the mean body temperature, respiration, and heart rate were within normal limits, but the averages were higher than those reported by the investigators [16]. As a matter of fact, in hot environmental conditions chickens open their mouths and increase respiration rates and respiration rates. The reason for this is to reduce body temperature by throwing water vapor from the lungs. As the ambient temperature increases, the breathing frequency increases and the need for metabolizable energy increases [17-19] to keep the animal breathing in order to reduce body temperature.

In the case of increased stresses such as temperature and humidity, the immune system is suppressed, and as a result, resistance to the disease has been reduced [20,21]. In this study, we found significant changes in the haematological tabulation of chickens grown under relatively stress conditions, an increase in the number of NOTRs compared to the above-mentioned studies, and a lower level in the LENF number averages. Similar findings are consistent with studies [22-24] that show that poultry treated with CS or ACTH has a reduced number of circulating lymphocytes. This decrease is due to the increase in the proportion of circulating heterophiles to lymphocytes, which is considered to be one of the most common stress symptoms in birds [25], ie the increase in heterophil/ lymphocyte ratio. This decrease in lymphocyte counts is probably due to lymphoid tissue tension due to long duration of stressors [26,27]. As a matter of fact, [28] stated that lymphocytes were consumed in germinal centers after ACTH or CS injections and that lymphocyte production was inhibited by lymphoid tissue atrophy (Virden and Kidd, 2009). Studies of heat stress on haematological parameters and macrophage activity have also shown that macrophage activity decreases due to temperature and heat stress up to 36°C, which reduces intestinal injury, leading to an increase in the population of pathogenic bacteria along the intestinal epithelium and also to infectious stress in poultry (Quinteiro-Filho et al. 2012; Verbrugghe et al. 2012).

Along with changes in hematological parameters during stress, there are also significant changes in blood composition. As a matter of fact, catabolism is promoted in order to meet the nutritional requirements for the synthesis of immune effector molecules while weakening body proteins and fat anabolism under immune stress [29,30]; If corticosteroids occur at high levels in the circulation; glucose and mineral metabolism, resulting in structural disorders such as cardiovascular disorders and hypercholesterolemia [31-33].

In the literature reviews we made; it has been determined that the results obtained in the studies investigating the blood biochemical parameters of the same breed in similar conditions and the values obtained in our study are different. Schaal et al. [34] found GLU levels to be 224, while our study found 243mg/dL. Again, different results of blood biochemical measurements were obtained from other studies with the same parameters. Gynesis et al. [35] conducted three phenotypes of the same breed of chicken in all three phenotypes; They found TP <5 (g / L), ALB (g / L) <2, HDL (mmol / L) <3, CPK <3000 (U / L) and LDH <2500 (U / L). Khawaja et al. (2012) reported different values for the results of our study as GLU 221 (mg/dL), cholesterol 138.75 (mg/dL), TP 05.10 (mg/dL).

Exposure of catecholamines to epinephrine and norepinephrine is increased when the strase is exposed. Especially, catecholamines play the most important role in altering epinephrine metabolism [31,36] Sabban and Kvetnansky, 2001. Epinephrine binds to β-adrenergic receptors on the cell membrane and results in an increase in the activation of certain enzymes, primarily the activation of protein kinases that activate glycogenolysis and gluconeogenesis Olanrewaju et al. 2006; [37]. In stress conditions, norepinephrine is responsible for providing energy from the fatty tissue for skeletal muscles [38,39]. In addition to GLU levels, some enzymes such as AST, GGT, and CHOL levels increase in tissues and tissues, mainly in muscle tissue, as a result of catabolic activities in tissues and organs [40-42]. In this study, similar to the ones reported by the researchers, it is proved that the levels of AST, GGT are close to the upper limits of the normal limits.

When compared to the studies we have conducted, the detection of very low levels of TB and no detection of IB levels is consistent with the report that chickens have insufficient production of bilirubin [43,44].

The obtained data also suggests that it is an original work at the same time that it is the quality that will form the reference for the Hy Line chickens raised in the region. We believe that it is essential for the poultry sector of our country and our country to investigate stress events affecting fertility in more detail [45-50].

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