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STUDY ON THE LEVEL OF NATURAL HUMORAL IMMUNITY IN TURKEY-BROILERS BRED ON TWO FLOOR TYPES

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Summary

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The experiments were performed on 80 turkey-broilers from 2 hybrid types (BUT-9 and St.Z-1), raised on a slat floor and on a litter, divided into 4 groups: BUT-9 raised on a slat floor; group II: BUT-9 – on a litter; group III – St.Z-1 on a slat floor and group IV: St.Z-1 – on a litter. The group density was 5 birds per square metres, i.e. an area of 0.2 m2 per bird. The activities of blood lysozyme and complement were assessed at the age of 14 and 16 weeks. The lysozyme activity was higher in turkey-broilers from both hybrids bred on a litter compared to those bred on a slat floor that could be explained by the more intensive locomotor activity and the various (microbial) factors that stimulated lysozyme activity. The hybrid type (BUT-9 or StZ=1), the gender or the housing system did not influence complement activity. That could be due to the lack of a significant antigen influence on complement activity of a given floor type.

Key words: complement, litter, lysozyme, slat floor, turkey-broilers

INTRODUCTION

Both lysozyme and complement as non-specific factors of innate immunity are important for the increase of systemic resistance against diseases and for the decrease in mortality rates in turkey hybrids. The effect of lysozyme against Gram-positive bacteria (Fainaru *et al.*, 1974; Buharin & Vasilev, 1977; Kondo *et al.*, 1982; Shidlovskaya, 1985) as well as that of complement against bacteria, viral and parasitic diseases (Grewal & Babiuk, 1980; Howard, 1980; Ohta *et al.*, 1983)) are well-known.

There are significant phenotypic variations in lysozyme and complement activities depending on the breed of turkeys (Sotirov *et al.*, 1998) that are considered to be a prerequisite for a selection aiming a high resistance of this avian species. At the same time, various factors could influence the levels of lysozyme, complement and the phagocytic activity. In turkeys, those parameters were reported to be stimulated via various growth promoters (Sotirov *et al.*, 2001).

The influence of the raising system on lysozyme and complement activities was

followed out in broiler chickens, bred in batteries and on a hard floor (Stoyanchev *et al.*, 1997). Higher levels in those two parameters were found out in broiler chickens raised on a hard floor. Similar reports in turkeys are however lacking.

The aim of the present study was to study the lysozyme and complement activities in turkey-broilers from the BUT-9 and StZ-1 hybrids, bred on a slat floor and on a litter.

MATERIALS AND METHODS

Two experiments were carried out at the Hybrid Poultry Centre – Stara Zagora under optimal conditions of feeding, drinking, heating and ventilation. Two turkey hybrids were included – BUT-9 (British United Turkeys Limited), imported from the UK and StZ-1, created in the Hybrid Poultry Centre – Stara Zagora, divided into 4 groups: group I: BUT-9 on a slat floor; group II: BUT-9 on a litter; group III - St.Z-1 on a slat floor and group IV: St.Z-1 on a litter.

Both experiments differed only by the period: the first one was peformed during the spring and the summer and the other – during the summer and the autumn. Each group consisted of 10 male and 10 female birds, raised from the age of 1 to 115 days. All groups were housed in separate sections in the same premise.

The dimensions of the premise were: length – 5 m, width – 4 m. The area of each section was 2×2 (4 m^2), bordered by a wire-netting. The slat floor sections were two. The slat floor was constructed of wooden panels, put on metal frames at a distance of 0.6 m from the floor. The width of slats was 40 mm and that of slots – 18 mm. The area under the slat floor was cleaned once a week. The litter sections were also two, same area, separated by a wire-netting. The litter consisted of-sawdust and straw with a thickness of 8–10 cm.

The density in all sections was 5 birds per square metres, i.e. an area of 0.2 m^2 per bird was allowed according to Manual B.U.T. requirements (Anonymous, 2000). The birds were fed on one central pipe-shaped feeding system with a diameter of 80 cm and a 12.56 cm front of nutrition. The drinkin water was supplied by 2 watering troughs for each section. Thus, a 3.5 cm front of drinking was provided vs 3 cm according to Manual B.U.T. (Anonymous, 2000).

The diet of turkeys (PROVIMI-ZARA, Stara Zagora), consisted of the forages: Starter (during the first month), Grower-1 (at the age of 4–8 weeks), Grower-2 (at the age of 8–12 weeks) and Finisher (at the age of 12–16 weeks). The Starter forage provided 26.25% crude protein and 2832.17 kcal/kg metabolizable energy, Grower-1 – 25.03% crude protein and 2900 kcal/kg metabolizable energy; Grower-2 – 26.25% crude protein and 2832.17 kcal/kg metabolizable energy and the Finisher – 17% crude protein and 3000 kcal/kg metabolizable energy.

The heating was accomplished with a 250 W infrared lamp per each section with an option for height regulation depending on the age of birds. In both experiments, the average local weekly temperature varied within the reference range specified in Manual B.U.T. (Anonymous, 2000): from 35.7±0.7 ^{o}C to 20.5±0.3 ^{o}C and from 37.7±0.2 ^{o}C to 17.3±0.3 ^{o}C during the first and the second experiment respectively.

The lighting during the first weeks was provided by the heating lamps and thereafter, by natural daylight (light coefficient 1:20).

The ventilation was natural. The air was recycled by opening of windows according to microclimatic parameters. The air velocity in the premise was between 0.1–0.3 m/s during the spring and 1–1.2 m/s during the summer.

The cleaning of manure under the slats and the replacement of the litter were performed once weekly in order to prevent the indirect influence of litter and to decrease as much as possible the effect of microbial flora and the litter on air quality. The concentrations of ammonia, carbon dioxide and dihydrogen sulfide were within the maximum allowable limits by Manual B.U.T. (Anonymous, 2000) in both experiments.

The activity of lysozyme (Lie, 1985) and complement (Sotirov, 1986) were assess in blood, obtained from the wing vein at the age of 14 and 16 weeks.

Data were statistically processed by analysis of variance.

RESULTS AND DISCUSSION

During the first experiment, lysozyme activities in male StZ-1 hybrids (Table 1) raised on a litter were statistically higher than those raised on a slat floor ($p<0.05$ at

Table 1. Activity of blood lysozyme (μg/mL) in broiler-turkeys from the British Turkey United (BUT-9) and Stara Zagora (StZ-1) hybrids bred on a slatt floor and on a litter. Data are presented as mean± SEM

Groups (n = 10)	Experiment I		Experiment II	
	Age of 14 weeks	Age of 16 weeks	Age of 14 weeks	Age of 16 weeks
Male hybrids				
Group I BUT-9 on a slat floor	0.49 ± 0.07	0.83 ± 0.23	0.26 ± 0.06	0.32 ± 0.08
Group II BUT-9 on a litter	0.39 ± 0.09	0.91 ± 0.29	0.71 ± 0.14**	0.63 ± 0.11*
Group III StZ-1on a slat floor	0.22 ± 0.04	0.48 ± 0.15	0.45 ± 0.12	0.35 ± 0.10
Group IV StZ-1 on a litter	0.60 ± 0.16*	0.74 ± 0.18	0.24 ± 0.08	0.31 ± 0.06
Female hybrids				
Group I BUT-9 on a slat floor	0.38 ± 0.11	0.66 ± 0.12	0.68 ± 0.25	0.82 ± 0.46
Group II BUT-9 on a litter	0.30 ± 0.13	0.83 ± 0.11	1.20 ± 0.29	1.20 ± 0.29
Group III StZ-1on a slat floor	0.56 ± 0.13	0.59 ± 0.11	0.34 ± 0.09	0.34 ± 0.15
Group IV StZ-1 on a litter	1.21 ± 0.39	0.80 ± 0.30	0.25 ± 0.04	0.34 ± 0.06

* $p<0.05$; ** $p<0.01$ vs male birds from the same hybrid raised on a slat floor.

Table 2. Activity of blood complement (CH50) in broiler-turkeys from the British Turkey United (BUT-9) and Stara Zagora (StZ-1) hybrids, bred on a slatt floor and on a litter. Data are presented as mean± SEM

Groups (n = 10)	Experiment I		Experiment II	
	Age of 14 weeks	Age of 16 weeks	Age of 14 weeks	Age of 16 weeks
Male hybrids				
Group I BUT-9 on a slat floor	514.50±18.19	540.34±18.86	569.84±4.35	480.42±60.41
Group II BUT-9 on a litter	540.16±46.20	500.12±11.84	592.23±8.79	566.91±4.77
Group III StZ-1on a slat floor	561.92±25.25	535.12±19.78	558.21±6.33	547.38±12.83
Group IV StZ-1 on a litter	596.72±11.15	525.99±8.32	551.92±25.18	534.62±11.30
Female hybrids				
Group I BUT-9 on a slat floor	526.49±16.99	520.60±17.50	593.48±9.09	548.97±12.03
Group II BUT-9 on a litter	579.88±8.43	486.73±15.60	580.50±10.83	580.50±10.83
Group III StZ-1on a slat floor	587.50±13.37	541.94±10.23	560.79±10.05	566.57±7.54
Group IV StZ-1 on a litter	596.72±11.15	525.99±8.32	546.99±9.86	536.60±12.20

the age of 14 weeks). The same tendency was observed during the second experiment as well for the BUT-9 hybrid at $p<0.05–0.01$. Although the corresponding differences between female hybrids in both trials were not statistically significant, there was a trend for higher lysozyme activity in turkeys raised on a litter. Therefore, it could be summed up that lysozyme activities in birds bred on litter were higher that those bred on a slat floor in both trials.

Our data are similar to those, obtained in broiler-chickens (Stoyanchev *et al.*, 1997), where lysozyme concentrations were higher in broilers raised on a floor compared to those raised in batteries. The tendency towards lysozyme elevation in turkey-broilers raised on a litter could be attributed to the better locomotor activity. Bozakova (2003) reported hat turkey-broilers from the BUT-9 and StZ-1 hybrids bred on a litter had significantly more active movements, higher incidence of dustbathing behaviour and increased sexual activity comapred to birds bred on a slat floor. This behaviour of turkey-broilers, proper to conditions ensuring the necessary comfort in a stress-free environment probably contributed to the

higher lysozyme activity – a prerequisite for a better non-specific systemic defense.

Complement activities (Table 2) were somewhat contradictory. In the first experiment performed at the age of 14 weeks, in both hybrids of both genders there was a tendency towards a higher complement activity when raised on a litter. The tendency at the age of 16 weeks was however the opposite, i.e. the higher activity was measured in turkeys raised in slat floor sections. The results from the second experiment were also contradictory thus suggesting that the hybrid type, the gender and the system of raising did not influence blood complement concentrations.

Our results differed from those of Sotirov *et al.* (1998), who reported significant differences in complement levels in various turkey breeds. The lack of differences in hybrids compared to pure breeds could be attributed to the intermediate inheritance of complement, that is the origin of the different blood concentrations. They could be moreover related to the lack of particular antigenic influences upon complement during the raising of turkey-broilers, due to the permanent control on zoohygienic parameters, the close observation of veterinary and sanitary rules, the regular cleansing of the slat floor and the weekly changing of the litter, to the implemented programme of prophylaxis etc. The weak antigenic influences are not therefore able to trigger a powerful factor of defense as is the complement.

The analysis of our results allowed us to assume that the lysozyme activity was higher in turkey-broilers bred on a litter compared to those bred on a slat floor. The hybrid type, the gender and the housing system did not influence blood complement concentrations.

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