



Original Contribution

STUDIES ON SOME PARACLINICAL INDICES IN LAMBS OF VARIOUS BREEDS

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ABSTRACT

Haematological studies were performed in 48 clinically healthy lambs from different lambs breeds – Bulgarian synthetic dairy population (BSDP), Trakia merino (TM), Ile de France (IIF) and Mouton Charollais (MS). The lambs were divided into four experimental groups (n=12). Blood was sampled from v. jugularis for haematological determinations of red blood cell counts (RBC), total white blood cell counts (WBC), haemoglobin content (HGB), haematocrit (HCT), mean corpuscular volume (MCV), blood glucose (Glu), total protein (TP), aspartataminotransaminase (ASAT), alaninaminotransaminase (ALAT), triglycerides (TG), calcium (Ca), inorganic phosphorus (P) and magnesium (Mg). The experiments were performed twice, at a 2-week interval. The haematological indices (red blood cell counts, haematocrit, blood glucose, alaninaminotransaminase, total protein and triglycerides) were highest in the lambs of Ile de France breed. The haemoglobin content, mean corpuscular volume, aspartataminotransaminase, inorganic phosphorus and magnesium were highest in the lambs of Mouton Charollais breed. The total white blood cell counts and calcium were highest in the lambs of Bulgarian synthetic dairy population.

Key words: haematological parameters, lambs, various breeds.

INTRODUCTION

The animal husbandry in Bulgaria is facing significant changes, related to its status of a new member of the European Union. One of its priority branches is sheep breeding. This fact determined the increased needs for production of additional, higher quality sheep products and in turn, becomes a challenge for veterinary medical and agricultural sciences with regard to the determination of cause-effect relationships between breed-related and productive traits and their relation to the healthy status.

The blood laboratory parameters are a consistent criterion for evaluation of physiological status of animals (1 – 4), directly related to their productivity (2, 5 – 7), as well as for evaluation of animal interior during the ontogenesis. On the other hand, they provide the opportunity for elucidation of the interaction productivity-health status (3, 5, 8), and furthermore, the synchronization of

higher productivity with animal health protection (2, 9 – 11).

In previous studies of ours (6, 7) aimed at establishing the correlation between productivity and health in Trakia merino sheep and the Stara Zagora breed, we observed considerable interbreed differences in both electrocardiographic parameters and in haematological and biochemical indices.

Similar differences were reported by us in studies on other laboratory indices (12) in lambs from the Trakia merino breed, Bulgarian synthetic dairy population and Ile de France.

Our data about interbreed differences in blood laboratory parameters correspond to those described in sheep (3, 13, 14), lambs (15), goats (2) and cattle (4).

The purpose of the present investigations was to perform comparative studies on the physiological parameters in lambs from different sheep breeds – Bulgarian synthetic dairy population, Trakia merino, Ile de France and Mouton Charollais and to determine the effect of the various production traits on the physiological parameters of selected traits.

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MATERIALS AND METHODS

The studies were conducted in the Agricultural Institute in Stara Zagora. The animals were divided into four groups: I group – Ile de France (IIF) (n=12), II group – Trakia Merino breed (TM) (n=12), III group – Mouton Charollais (MC) (n=12) and IV group – Bulgarian synthetic dairy population (BSDP) (n=12). The groups comprised clinically healthy lambs of uniform weight (35 kg).

Blood was sampled from *v. jugularis* for haematological determinations of the following laboratory parameters – red blood cell counts (RBC; T/L), white blood cell counts (WBC; G/L) haematocrit (HCT; %), mean corpuscular volume (MCV; fl) and haemoglobin (HGB; g/L) content on an automated haemoanalyser (Serono+System 150, USA), blood glucose (Glu; mmol/L), total protein (TP; g/L), aspartataminotransaminase (ASAT; UI/L), alaninaminotransaminase (ALAT; UI/L), triglycerides (TG; mmol/L), calcium (Ca; mmol/L), inorganic phosphorus (P; mmol/L) and magnesium (Mg; mmol/L) concentrations on an automated biochemical analyzer (Olympus AU 600, Japan).

Haematological studies were performed twice, at a 14-day interval.

The data were statistically processed by Student's t- test for comparing different groups within them when a significant effect was evidenced by ANOVA. Differences were considered statistically significant at the $p < 0.05$ level.

RESULTS AND DISCUSSION

I. Haematological studies. *The haematological data (Table 1) in lambs from different breeds (Ile de France, Trakia Merino breed, Mouton Charollais and Bulgarian synthetic dairy population) showed important interbreed variations in the average values of studied haematological parameters.*

The mean RBC counts and haematocrit values were the highest in Ile de France lambs – 13.59 ± 0.79 T/L and 37.43 ± 2.29 % respectively, compared to all other breeds, where significant differences in studied parameters were not observed.

The mean corpuscular volume (MCV) did not exhibit breed-related variations with the exception of the values in Mouton Charollais lambs, where MCV values were higher, although slightly different vs the lambs of the other breeds.

Table 1. Haematological indices in lambs of various breeds – Ile de France (IIF), Trakia Merino breed (TM), Mouton Charollais (MS) and Bulgarian synthetic dairy population (BSDP).

I	IIF	TM	D	IIF	MS	D	IIF	BSDP	D
	$\bar{x} \pm S\bar{x}$	$\bar{x} \pm S\bar{x}$	%	$\bar{x} \pm S\bar{x}$	$\bar{x} \pm S\bar{x}$	%	$\bar{x} \pm S\bar{x}$	$\bar{x} \pm S\bar{x}$	%
RBC	13.59 ± 0.79	11.84 ± 0.75^b	14.78	13.59 ± 0.79	11.46 ± 0.86^b	18.59	13.59 ± 0.79	11.98 ± 1.06^b	13.44
HCT	44.16 ± 1.80	37.73 ± 2.47^b	17.04	44.16 ± 1.80	38.18 ± 2.44^b	15.66	44.16 ± 1.80	37.48 ± 2.81^b	17.82
MCV	32.69 ± 0.79	$31.96 \pm 0.72^{n.s.}$	2.28	32.69 ± 0.79	$33.44 \pm 0.51^{n.s.}$	2.29	32.69 ± 0.79	$32.01 \pm 1.01^{n.s.}$	2.12
WBC	16.04 ± 1.58	13.76 ± 2.13^b	16.57	16.04 ± 1.58	14.62 ± 0.73^a	9.71	16.04 ± 1.58	21.09 ± 3.22^b	31.48
HGB	110.17 ± 1.76	101.75 ± 3.14^b	8.28	110.17 ± 1.76	$110.40 \pm 8.66^{n.s.}$	0.20	110.17 ± 1.76	100.33 ± 3.72^a	9.81
	TM	MS		TM	BSDP		MS	BSDP	
RBC	11.84 ± 0.75	$11.46 \pm 0.86^{n.s.}$	3.31	11.84 ± 0.75	$11.98 \pm 1.06^{n.s.}$	1.18	11.46 ± 0.86	$11.98 \pm 1.06^{n.s.}$	4.54
HCT	37.73 ± 2.47	$38.18 \pm 2.44^{n.s.}$	1.19	37.73 ± 2.47	$37.48 \pm 2.81^{n.s.}$	0.67	38.18 ± 2.44	$37.48 \pm 2.81^{n.s.}$	1.87
MCV	31.96 ± 0.72	33.44 ± 0.51^a	4.63	31.96 ± 0.72	$32.01 \pm 1.01^{n.s.}$	0.16	33.44 ± 0.51	32.01 ± 1.01^a	4.47
WBC	13.76 ± 2.13	$14.62 \pm 0.73^{n.s.}$	6.25	13.76 ± 2.13	21.09 ± 3.22^b	53.27	14.62 ± 0.73	21.09 ± 3.22^b	44.25
HGB	101.75 ± 3.14	110.40 ± 8.66^b	8.50	101.75 ± 3.14	$100.33 \pm 3.72^{n.s.}$	1.42	110.40 ± 8.66	100.33 ± 3.72^b	10.04

Legend: I (Indices), D (Different), RBC (Red blood cell; T/L), HCT (Haematocrit; %), MCV (Mean corpuscular volume; fl), WBC (White blood cell; G/L), HGB (Haemoglobin; g/L).

Level of significance vs controls: ^{n.s.} Not Significant; ^a $P < 0.05$; ^b $P < 0.01$.

Considerable interbreed differences were found in average WBC counts. The highest values were observed in lambs from dairy sheep breeds (BSDP) – 21.09 ± 3.22 G/L, compared to IIF (31.48 %), TM (53.27 %) and MC (44.25 %).

The maximum haemoglobin concentrations were established in MC and

IIF, 110.40 ± 8.66 g/L and 110.17 ± 1.76 g/L, respectively, compared to TM (101.75 ± 3.14 g/L) and BSDP (100.33 ± 3.72 g/L) lambs.

II. Biochemical studies. *Interbreed differences in lambs existed also in blood biochemical indices (Table 2).*

The highest blood sugar concentrations were determined in IIF lambs (5.22 ± 0.23 mmol/L), vs MC lambs (6.53 %), BSDP (10.36 %) and TM (19.72 %).

The activity of aspartate

aminotransferase (ASAT) was two- and three-fold higher in MC lambs – 356.4 ± 14.87 U/L, than in IIF (120 %), TM (186.7 %) and BSDP (194 %).

Tabl. 2. Biochemical indices in lambs of various breeds – Ile de France (IIF), Trakia Merino breed (TM), Mouton Charollais (MS) and Bulgarian synthetic dairy population (BSDP).

<i>I</i>	<i>IIF</i>	<i>TM</i>	<i>D</i>	<i>IIF</i>	<i>MS</i>	<i>D</i>	<i>IIF</i>	<i>BSDP</i>	<i>D</i>
	$\bar{x} \pm S\bar{x}$	$\bar{x} \pm S\bar{x}$	%	$\bar{x} \pm S\bar{x}$	$\bar{x} \pm S\bar{x}$	%	$\bar{x} \pm S\bar{x}$	$\bar{x} \pm S\bar{x}$	%
Glu	5.22 ± 0.23	4.36 ± 0.16^b	19.72	5.22 ± 0.23	4.90 ± 0.18^a	6.53	5.22 ± 0.23	4.73 ± 0.13^b	10.36
ASAT	162 ± 11.74	124.3 ± 15.99^b	30.33	162 ± 11.74	356.4 ± 14.87^b	120	162 ± 11.74	121.2 ± 10^b	32.01
ALAT	31.73 ± 2.50	$27.92 \pm 6.29^{n.s.}$	13.65	31.73 ± 2.50	22.96 ± 1.62^b	38.20	31.73 ± 2.50	24.37 ± 1.13^b	30.20
TP	68.68 ± 1.31	60.33 ± 1.09^b	13.84	68.68 ± 1.31	61.60 ± 1.60^b	11.49	68.68 ± 1.31	62.83 ± 0.97^b	9.31
TG	0.32 ± 0.08	$0.28 \pm 0.02^{n.s.}$	4.30	0.32 ± 0.08	$0.25 \pm 0.04^{n.s.}$	2.80	0.32 ± 0.08	0.29 ± 0.02^b	10.34
Ca	2.03 ± 0.03	1.96 ± 0.06^a	4.57	2.03 ± 0.03	$2.06 \pm 0.06^{n.s.}$	1.48	2.03 ± 0.03	$2.08 \pm 0.03^{n.s.}$	2.46
P	2.13 ± 0.07	2.04 ± 0.11^a	4.41	2.13 ± 0.07	2.63 ± 0.09^b	23.47	2.13 ± 0.07	1.88 ± 0.13^a	13.30
Mg	0.84 ± 0.02	0.96 ± 0.01^b	14.29	0.84 ± 0.02	1.04 ± 0.02^b	23.81	0.84 ± 0.02	0.98 ± 0.01^b	16.67
	TM	MS		TM	BSDP		MS	BSDP	
Glu	4.36 ± 0.16	4.90 ± 0.18^b	12.39	4.36 ± 0.16	4.73 ± 0.13^b	8.49	4.90 ± 0.18	4.73 ± 0.13^a	3.59
ASAT	124.3 ± 15.99	356.4 ± 14.87^b	186.7	124.3 ± 15.99	$121.2 \pm 10^{n.s.}$	2.56	356.4 ± 14.87	121.2 ± 10^b	194
ALAT	27.92 ± 6.29	22.96 ± 1.62^b	21.60	27.92 ± 6.29	24.37 ± 1.13^a	14.56	22.96 ± 1.62	24.37 ± 1.13^b	6.14
TP	60.33 ± 1.09	$61.60 \pm 1.60^{n.s.}$	2.11	60.33 ± 1.09	62.83 ± 0.97^a	4.14	61.60 ± 1.60	$62.83 \pm 0.97^{n.s.}$	1.99
TG	0.28 ± 0.02	0.25 ± 0.04^b	12.00	0.28 ± 0.02	$0.29 \pm 0.02^{n.s.}$	0.80	0.25 ± 0.04	0.29 ± 0.02^a	16.0
Ca	1.96 ± 0.06	2.06 ± 0.06^b	5.10	1.96 ± 0.06	2.08 ± 0.03^b	6.12	2.06 ± 0.06	$2.08 \pm 0.03^{n.s.}$	0.97
P	2.04 ± 0.11	2.63 ± 0.09^b	28.92	2.04 ± 0.11	1.88 ± 0.13^a	8.51	2.63 ± 0.09	1.88 ± 0.13^b	39.90
Mg	0.96 ± 0.01	1.04 ± 0.02^b	8.33	0.96 ± 0.01	0.98 ± 0.01^a	2.08	1.04 ± 0.02	0.98 ± 0.01^b	6.12

Legend: *I* (Indices), *D* (Different), *Glu* (blood glucose; mmol/L), *ASAT* (aspartataminotransaminase; UI/L), *ALAT* (alaninaminotransaminase; UI/L), *TP* (total protein; g/L), *TG* (triglycerides; mmol/L), *Ca* (calcium; mmol/L), *P* (inorganic phosphorus; mmol/L), *Mg* (magnesium; mmol/L).

Level of significance vs controls: ^{n.s.} Not Significant; ^a $P < 0.05$; ^b $P < 0.01$.

The variations in alanine aminotransferase (ALAT) although statistically significant, were similar in all studied animals. The maximum ALAT activity was observed in the IIF breed – 31.73 ± 2.50 U/L, compared to TM (13.65 %), BSDP (30.20 %) and MC (38.20 %).

Again, the highest total protein values were measured in the IIF breed – 68.68 ± 1.31 g/L. In the other breeds, the studied parameter evidenced insignificant variations (BSDP – 30.20 %, MC – 38.20 % and TM – 13.65 %), vs IIF lambs.

Blood triglycerides (TG) were similar in all breeds, with minor differences between breeds. The highest TG levels were observed in IIF lambs – 0.32 ± 0.08 mmol/L.

Calcium concentrations were very close in all sheep breeds.

The other blood macroelements – inorganic phosphate (P) and magnesium (Mg) were the most elevated in Mouton Charollais lambs: 2.63 ± 0.09 mmol/L and 1.04 ± 0.09 mmol/L, respectively. In the other breeds, although statistically significant, the values of studied parameters were close.

The performed studies showed significant differences in the average values of studied blood laboratory parameters in lambs from the Ile de France, Trakia Merino breed, Mouton Charollais and Bulgarian synthetic dairy population breeds. The obtained data were within the reference ranges for clinically healthy animals (3, 5, 9 - 12, 14 - 16). Our data showed that in Ile de France lambs, the red blood cell counts, the haematocrit, the blood glucose, the alanine aminotransferase, the triglycerides and the total protein were the highest than the respective values in the other three breeds. In Mouton Charollais lambs, the mean corpuscular volume, haemoglobin concentrations, aspartate aminotransferase activities, the inorganic phosphate and the magnesium were with the highest values. The white blood cell counts and blood calcium concentrations were the highest in lambs from the dairy breed (BSDP).

In the view of a number of investigations upon the corresponding mutability, there is a correlation between blood laboratory parameters and productive traits that are determined not only by the

genetic potential, but also by the parameters of homeostasis (2 - 5, 8, 10, 11, 14, 15).

It must be stated that the studies performed evidenced the existence of significant changes in the mean paraclinical indices in various studied lambs breeds. Therefore, these data could be valuable for both veterinary theory and practice and could be used for evaluation of physiological status of lambs according to their breed characteristics.

CONCLUSIONS

1. The mean of red blood cell counts (RBC), haematocrit (HCT), blood glucose (Glu), alaninaminotransaminase (ALAT), total protein (TP) and triglycerides (TG) were significantly highest in the lambs of Ile de France breed.
2. The mean of haemoglobin content (HGB), mean corpuscular volume (MCV), aspartataminotransaminase (ASAT), inorganic phosphorus (P) and magnesium (Mg) were significantly highest in the lambs of Mouton Charollais breed.
3. The mean of white blood cell counts (WBC) and calcium (Ca) were significantly highest in the lambs Bulgarian synthetic dairy population.

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