



ELECTROCARDIOGRAPHIC AND HAEMATOLOGICAL STUDIES IN DIFFERENT SHEEP BREEDS

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ABSTRACT

Electrocardiographic and haematological studies were performed in 14 clinically healthy sheep from the Trakia merino and Stara Zagora breeds. The sheep were divided into two experimental groups (n=7). The ECG records were done in the three bipolar (I, II, III) and the three unipolar leads (aVR, aVL, aVF), prior to the morning feeding. After ECG monitoring, blood was sampled from v. jugularis for haematological determinations of red blood cell counts, total white blood cell counts, haemoglobin content, haematocrit and mean corpuscular volume. The experiments were performed twice, at a 2-week interval.

The data evidenced some breed-related differences in the P peak and the QRS complex. The haematological indices (red blood cell counts, haemoglobin and haematocrit) were higher in the Trakia merino sheep. The total white blood cell counts and the mean corpuscular volume were lower than those in the Stara Zagora breed.

Key words: ECG, erythrocytes, leucocytes, sheep

INTRODUCTION

In light of the ongoing process of Bulgaria's integration into the EU, several prioritized branches of agriculture can be identified, one of them - sheep breeding. This determines the increased interest of producers towards higher meat, milk and wool production rates. This tendency is also interesting from the point of view of casual relationships of productivity and health. The Trakia merino and the Stara Zagora breeds are from a different productivity types, meat-type and wool-type, respectively. They are among the commonest breeds, reared in the region of Stara Zagora.

Cardiovascular system is one of the most important physiological systems directly related to animal productivity (1 - 5). The parameters of the electrocardiogramme (ECG) are an objective criterion for its functional state. On the other side, haematological parameters are used for reliable evaluation of physiological status as

well (5 - 8). As a result, the study on these parameters in sheep could be useful in the light of the productivity-health relationship with regard to the harmonization of the higher productivity and animal welfare.

The aim of the present studies was to perform comparative investigations upon the physiological ECG and haematological parameters in sheep from the Trakia merino and Stara Zagora breeds.

MATERIAL AND METHODS

The experiments were performed in the production centre of the Institute of Agriculture – Stara Zagora. For this purpose, 14 clinically healthy sheep were chosen using the method of analogues. The sheep were divided into two groups: group I – from the Trakia merino breed (n=7) and group II – from the Stara Zagora breed (n=7).

The ECG records were done prior to the

morning feeding with an ECG-1222A electrocardiograph at a tape rate of 50 mm/s and calibration tension of 1 mV=10 mm. The animals were fixed in a restrainer and ECG registration was done after a 15 min stay within as followed: three times at 10 min intervals. The three standard bipolar (I, II and III) and the three unipolar (aVR, aVL, aVF) leads were registered according to Kostov (4). ECG records were processed in standard bipolar lead I, determining the duration of the various intervals, the amplitude of P- and T-waves, the QRS complex, the heart rate and the systolic parameter (SP).

After ECG monitoring, blood was sampled from *v. jugularis* for haematological determinations of red blood cell counts, haematocrit, mean corpuscular volume, white blood cell counts and haemoglobin content on an automated haemoanalyser Serono+System 150, USA. The ECG and haematological studies were performed twice, at a 14-day interval.

The data were statistically processed using the Statistica software. The level of significance of differences was assessed by one-way analysis of variance (ANOVA). Differences were considered statistically significant at the $p < 0.05$ level.

RESULTS AND DISCUSSION

The ECGs in both studied breeds of sheep in bipolar lead I exhibited P- and T-waves located under the isoelectric line (negative) whereas the ventricular QRS complex is deep and positive (over the isoelectric line) (Fig. 1). In bipolar lead II a negative P-wave and positive T-wave and ventricular complex were registered. The locations of P- and T-waves and the QRS complex in bipolar lead III were the opposite to those in the bipolar lead I, i.e. the waves were upward and the QRS complex – negative.

The electrocardiograms obtained by us corresponded to a certain extent to those described by Hmil (7). It could be emphasized that the insignificant deviations (negative ventricular complex in lead I) in the ECG described by the author, was probably due to change in the topographic location of the green electrode during the registration of the cardiac biopotentials.

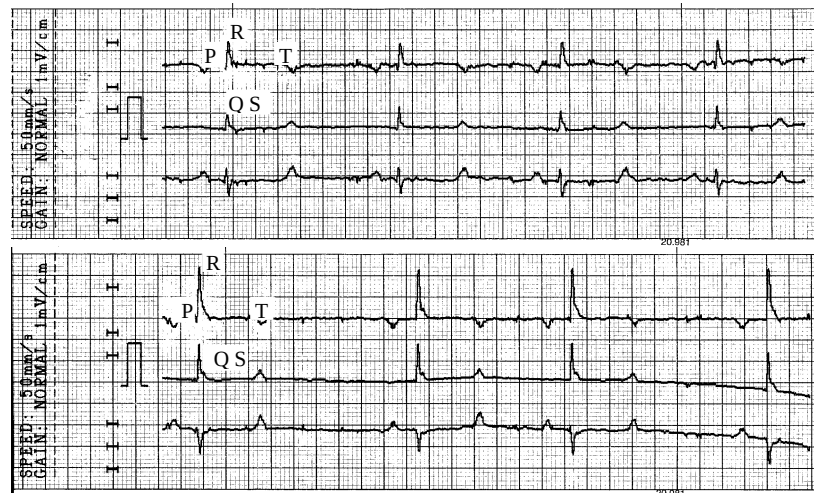


Fig. 1. Electrocardiograms in different sheep breeds - Trakia merino sheep (up) and Stara Zagora sheep (below).

The dynamics of the average values of principal ECG parameters is presented in Table 1. There were no statistically significant differences in most ECG parameters. The values of the atrial PQ interval, the total systole (P-T), the cardiac systole (Q-T), the cardiac cycle (R-R) and the ST segment were very similar one to another. Heart rates and systolic parameter values in both breeds were within the reference range and the differences were not statistically significant. The data reported by Hayes et al. (6) were comparable to ours. As to the P-wave amplitude, it could be stated that there was a considerable breed-related difference ($P < 0.05$). A similar tendency was also exhibited by the average amplitudes of the positive ventricular complex (Table 1). In the Trakia merino breed, the values were 0.53 ± 0.10 mV and in the Stara Zagora breed – 0.85 ± 0.20 mV ($P < 0.01$). The high P-wave and QRS amplitudes in the latter breed evidenced about a predominating inotropic effect upon the myocardium in these sheep.

More characteristic breed-related differences were observed in haematological parameters (Tabl. 2) The red blood cell counts, haematocrit and haemoglobin content were higher in the Trakia merino sheep than in Stara Zagora sheep: 11.57 ± 0.77 T/l and 9.62 ± 0.37 T/l ($P < 0.01$), 37.43 ± 2.29 % and 32.48 ± 1.22 % ($P < 0.01$) and 104.55 ± 2.44 g/l vs 100.50 ± 2.43 g/l ($P < 0.01$), respectively. The opposite tendency was observed for the mean corpuscular volume and

the total white blood cell counts, that were lower in the animals from group I: 33.19 ± 0.69 fl vs 33.83 ± 0.79 fl ($P < 0.05$) and 15.43 ± 1.80 G/l vs 17.24 ± 1.52 G/l ($P < 0.01$).

It must be stated that the studies performed evidenced about the existence of statistically significant changes in the mean ECG and haematological indices in both studied sheep breeds. The obtained data could be due, on one part, to the breed of sheep and on the other, to their productivity type. Therefore, these data could be valuable for both veterinary theory and practice and could be used for evaluation of physiological status of sheep according to their breed characteristics.

CONCLUSIONS

1. The P wave and QRS amplitudes of the ECGs of the Stara Zagora breed were higher compared to the Trakia merino breed.
2. In the Trakia merino breed, the values of red blood cell counts, haematocrit and haemoglobin content were statistically significantly higher than in sheep from the Stara Zagora breed.
3. The mean corpuscular volumes and white blood cell counts were statistically significantly higher in the Stara Zagora breed.

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Tabl. 1. Electrocardiograms parameters in different sheep breeds - Trakia merino sheep (group I) and Stara Zagora sheep (group II).

Groups	Parameters	P-wave		Intervals					S-T segment	T-wave		QRS amplitudes		HR	SP
		s	mV	P-Q	P-T	T-P	Q-T	R-R		s	mV	s	mV		
				s	s	s	s	s						min ⁻¹	%
I	$\bar{X}$	0.06	-0.17	0.11	0.41	0.33	0.30	0.76	0.22	0.06	0.07	0.04	0.53	79.55	40.2
	S $\bar{X}$	0.01	0.04	0.02	0.04	0.07	0.04	0.08	0.02	0.01	0.22	0.01	0.10	7.57	5.2
II	$\bar{X}$	0.06	-0.21 ^a	0.11	0.42	0.34	0.31	0.76	0.21	0.05	-0.18	0.06	0.85 ^b	77.90	39.9
	S $\bar{X}$	0.01	0.02	0.02	0.04	0.08	0.03	0.08	0.02	0.01	0.14	0.01	0.20	8.57	4.6

^aP<0.05; ^bP<0.01

Legends: HR - Heart rate; SP - Systolic parameter

Tabl. 2. Haematological parameters in different sheep breeds - Trakia merino sheep (group I) and Stara Zagora sheep (group II).

Groups	RBC (T/L)	Haematocrit (%)	MCV (fL)	WBC (G/L)	Haemoglobin (g/L)
I	11.57 ± 0.77	37.43 ± 2.29	33.19 ± 0.69	15.43 ± 1.80	104.55 ± 2.44
II	9.62 ± 0.37^b	32.48 ± 1.22^b	33.83 ± 0.79^a	17.24 ± 1.52^b	100.50 ± 2.43^b

^aP<0.05; ^bP<0.01

Legends: RBC - Red blood cell; MCV - Mean corpuscular volume; WBC - White blood cell