

## COMPARATIVE STUDY OF SOME BLOOD SERUM PARAMETERS IN SIX BULGARIAN SHEEP BREEDS

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### Abstract

This study was performed with 180 individuals belonging to six sheep breeds raised in Bulgaria - Karakachan (KK - 38), Cooper-Red Shumen (CRS - 13), Synthetic Population Bulgarian Milk (SPBM - 34), Caucasian Merino (CM – 30), Karnobat Merino (KM – 35) and Il de France (IdF – 30). Blood samples were collected from v. jugulars and using a semi-automatic biochemical analyzer were determined Serum Alkaline Phosphatase (ALP), Creatinine (Cr), AST (Aspartate Aminotransferase), ALT (Alanine Aminotransferase) and LDH (Lactate Dehydrogenase). The obtained results indicated that values despite being within the normal range for the species showed a wide variation.

**Key words:** *blood, parameters, serum, sheep.*

### Introduction

In recent years the quality and hygiene of farm animal products became in focus. Only healthy animals could give good production. Therefore a regular testing of some blood parameters is required (Smith et al., 2009). Liver enzyme levels are an objective indicators of an animal's physical condition and health status. For this reason, their research is an important source of information not only about the physiological condition of animals, but also an early indicator of a disease process, which can significantly decrease the quality of production and reproduction performances of sheep. The values could vary among different species and breeds (Gurzhav et al, 1968; James, 1968;; Garry et al, 1990; Kerr, 2002).

Biochemical values are very important indicator for assessing the status of animals, as well as for preparing the overall breeding program in livestock farms (Opara et al., 2010). Monitoring the concentration of biochemical parameters as well as concentrations of hormones in the blood of sheep gives us a clearer picture of their nutritional status, health and welfare (Antunovic et al., 2011).

There is insufficient and unsatisfactory information about blood parameters in Bulgarian local and indigenous sheep breeds.

The aim of present work was comparative study on some of the most frequently investigated biochemical parameters of blood serum in six Bulgarian sheep breeds - Karakachan (KK), Cooper-

Red Shumen (CRS), Synthetic Population Bulgarian Milk (SPBM), Caucasian Merino (CM), Karnobat Merino (KM) and Il de France (IdF).

## Materials and methods

Present study was conducted with 180 animals of six sheep breeds – Karakachan (KK - 38), Cooper-Red Shumen (CRS - 13), Synthetic Population Bulgarian Milk (SPBM - 34), Caucasian Merino (CM – 30), Karnobat Merino (KM – 35) and Il de France (IdF – 30), raised in different region in Bulgaria. Blood samples were obtained from v. jugularis for determination of serum Alanine Aminotransferase (ALT), Aspartate Aminotransferase (AST), Lactate Dehydrogenase (LDH), Alkaline Phosphatase (ALP), urea and creatinine. Blood samples were taken in vakueti for serum with gel-clot activator and tested with ready kits “Human”, using a semi-automatic biochemical analyzer Screen master LIHD-113, manufactured by the German company Hospital Diagnostic. All results were statistically processed by software program Excel.

## Results and discussion

Results from the conducted study with six sheep breeds and five biochemical parameters are shown in table 1,2,3,4,5 and 6.

Table 1. Values of Urea, mmol/l

| Breed | n  | Min | Max  | Mean/SD    | Mean for the breed |
|-------|----|-----|------|------------|--------------------|
| KK    | 38 | 3.9 | 9.1  | 6.3±1.41   | 2,86-7,14          |
| CRS   | 13 | 5.5 | 11.6 | 8.8±1.82   |                    |
| SPBM  | 34 | 5.7 | 12.6 | 8,8±1,73   |                    |
| CM    | 30 | 0.5 | 12.1 | 8,8± 2,12  |                    |
| KM    | 35 | 6.4 | 14.6 | 10,8± 3,09 |                    |
| IdF   | 30 | 6.6 | 13.3 | 11,8± 1,33 |                    |

The average values of urea vary from 6.3 mmol/l in the animals of the Karakachan breed to 11.8 mmol/l in Ile de France. The Karakachan breed is an indigenous breed for our region, where only maintenance selection is conducted in order to preserve the valuable qualities. Ile de France is a meat breed imported from France, and is expected to have the highest protein metabolism

Table 2. Values of Creatinine, µmol/l

| Breed | n  | Min  | Max    | Mean/SD      | Mean for the breed |
|-------|----|------|--------|--------------|--------------------|
| KK    | 38 | 42.4 | 133.05 | 75±19.99     | 44.0-150           |
| CRS   | 13 | 45.9 | 79.9   | 61±9.35      |                    |
| SPBM  | 34 | 47.8 | 206    | 77.22±41.69  |                    |
| CM    | 30 | 73.5 | 123.7  | 96.5± 12.68  |                    |
| KM    | 35 | 39.4 | 154.3  | 77.0± 20.83  |                    |
| IdF   | 30 | 92.2 | 233.9  | 115.5± 24.44 |                    |

Mean creatinine values ranged from 61  $\mu\text{mol/l}$  in Cooper-Red Shumen to 115.5  $\mu\text{mol / l}$  in Ile de France breed. Similar to the urea, the highest value was observed in Ile de France breed. This can be explained by the fact that the Ile de France breed is a typical meat breed, and creatinine secretion is a function of muscles and it is not influenced by gender, age, diet and more (Alex and Laverne, 1983).

Table 3. Values of ALT, U/L

| Breed | n  | Min  | Max  | Mean/SD         | Mean for the breed |
|-------|----|------|------|-----------------|--------------------|
| KK    | 38 | 0.53 | 17.6 | 6.5 $\pm$ 4.86  | 4-15               |
| CRS   | 13 | 1.3  | 24.2 | 12 $\pm$ 6.76   |                    |
| SPBM  | 34 | 0,69 | 76.4 | 15 $\pm$ 14.23  |                    |
| CM    | 30 | 10,2 | 38.0 | 24.7 $\pm$ 6.46 |                    |
| KM    | 35 | 2.2  | 24.1 | 12.8 $\pm$ 5.60 |                    |
| IdF   | 30 | 0.5  | 42.6 | 19.9 $\pm$ 9.75 |                    |

The average values of ALT vary from 6.5 U/l in Karakachan breed to 24.7 U/l in Caucasian Merino. Here, as in urea, the lowest value is observed in animals of the Karakachan breed.

ALT is an enzyme that is most presented in the liver and its level is an indicator of the health status of animals, on which depends the quality of meat in general (Shumaila et al., 2012).

Table 4. Values of AST, U/L

| Breed | n  | Min  | Max   | Mean/SD           | Mean for the breed |
|-------|----|------|-------|-------------------|--------------------|
| KK    | 38 | 37.3 | 123.1 | 87 $\pm$ 24.90    | 30-80              |
| CRS   | 13 | 18.2 | 187.4 | 92.2 $\pm$ 41.85  |                    |
| SPBM  | 34 | 51.7 | 371.0 | 110.3 $\pm$ 71.65 |                    |
| CM    | 30 | 70.7 | 165.9 | 102.8 $\pm$ 19.53 |                    |
| KM    | 35 | 10.9 | 157.8 | 87.2 $\pm$ 33.61  |                    |
| IdF   | 30 | 65.7 | 162.5 | 102.4 $\pm$ 20.77 |                    |

The average values of AST vary from 87 U/l in the animals of Karakachan breed to 110.3 U/l in the SPBM breed. Here, the lowest mean value is observed also in animals from Karakachan breed. AST values are an important indicator for early diagnosis of skeletal muscle disorders that can lead to serious deterioration in animal health status and productive traits (Sidahomen et al., 2013).

Table 5. Values of ALP, U/L

| Breed |  | n  | Min  | Max    | Mean/SD       | Mean for the breed |
|-------|--|----|------|--------|---------------|--------------------|
| KK    |  | 38 | 52.3 | 382.75 | 222.45±101.08 | 45-235             |
| CRS   |  | 13 | 22.5 | 871.9  | 404.6±259.73  |                    |
| SPBM  |  | 34 | 2.1  | 1347.3 | 402.6±355.99  |                    |
| CM    |  | 30 | 0.5  | 244.8  | 92.8± 44.52   |                    |
| KM    |  | 35 | 7    | 324    | 163 ± 80.39   |                    |
| IdF   |  | 30 | 17.3 | 338.4  | 220.9± 93.42  |                    |

Mean values of alkaline phosphatase ranged from 92.8 U/l in the Caucasian Merino breed to 404.6 U/l in CRS breed. Higher ALP values depend on the age of the animals, and in adolescents the serum activity of the indicator is higher than in adults (Kozat et al., 2011). Serum ALP activity was found to be within the reference range (69–387 U/L) (Kaneko et al., 1997) for sheep. In our study in breeds Cooper-Red Shumen and Synthetic Population Bulgarian Milk the values of ALP are higher than the others. Probably the differences we obtained between the different breeds are due to age variations between the animals from the different herds, despite the fact that all the studied animals were ewes.

Table 6. Values of LDH, U/L

| Breed | n  | Min    | Max    | Mean/SD        | Mean for the breed |
|-------|----|--------|--------|----------------|--------------------|
| KK    | 38 | 267.15 | 308.75 | 495.25±173.57  | Up to 530          |
| CRS   | 13 | 357.6  | 866.3  | 542.8±214.46   |                    |
| SPBM  | 34 | 62.8   | 1376.7 | 518.8±294.57   |                    |
| CM    | 30 | 468    | 914    | 665.3 ± 117.45 |                    |
| KM    | 35 | 492    | 1043   | 765± 145.08    |                    |
| IdF   | 30 | 129.3  | 470.5  | 324.2± 68.62   |                    |

The average values of LDH vary from 324.2 U/l in sheep of IdF breed to 765 U/l in sheep of the Karnobat Merino breed. These values are within the normal range as available in the literature (Lipecka et al, 2010; Kiran et al., 2012). Increased LDH levels may be due to infectious processes associated with rupture of liver and kidney tissue (Antunovic et al., 2015).

The indicators urea, creatinine, AST and ALT have the lowest obtained values in the animals of Karakachan breed. This is an old breed, which has a maintenance selection in order to preserve its unique gene pool. It is characterized by excellent adaptability to complicated environmental conditions but with relatively low productivity, and the last is a probable reason for lower levels of metabolism and reduced oxidative processes, and hence lower values of biochemical parameters.

The productive traits of animals are directly related with health status and parameters of homeostasis (Slavova et al., 2015). In recent years, interest in studying the relationship between blood indicators and productivity is growing and researches in this field become more and more

carefull and extensive (Binev et al., 2008; Todorova et al., 2010; Angelov et al., 2013a; Angelov et al., 2013b).

The relationship between some blood biochemical variations and productive and reproductive characteristics in sheep has been studied by many authors (Kaneko et al., 1997; Shaharbabak et al., 2009; Antunovic et al., 2015).

In the last decade in Bulgaria a number of studies have been conducted on biochemical indicators and their relationship with productive performances of different sheep breeds. Angelov et al., (2013a, 2013b) in two researches studied the level of creatinine, urea, AST, ALT, alkaline phosphatase, LDH, etc., in a total of 140 animals from two Bulgarian indigenous sheep breeds - Karakachanska and Cooper-Red Shumen. They reported that the levels of the studied indicators were within the permissible reference limits for the species. However, they also observed lower levels of values in Karakachan sheep breed.

Dias et al., (2010) studied 73 healthy, non-pregnant and non-lactating sheep of the Portuguese breed Churra-da-Terra-Quente. All animals were kept under the same environmental conditions and the same diet. They determinead the values of the main biochemical parameters - urea, creatinine, AST, ALT, alkaline phosphatase, etc., and reported that all indicators were in the reference values for the species.

Antunovic et al., (2011) studied 45 sheep (15 pregnant, 15 lactating and 15 non-pregnant) and reported инцреасед levels of AST and ALT in lactating sheep, which is an indicator of increased hepatic metabolism. Significantly higher LDH levels were observed in lactating sheep than in pregnant ones.

Kozat et al., (2011) tested the biochemical parameters AST, ALT, LDH, ALP, etc., in 150 Akkaraman lambs and summarized that higher values of these indicators may be a consequence of diseases that affect the productive abilities of the animals. For this reason, regular diagnostics and monitoring of the animals is extremely important for their productivity.

## Conclusion

The studied parameters showed that the animals are clinically healthy and they are a representatives for the breeds. However, high variation of the values was observed between the different breeds and between different parameters. This is acceptable because the analyzed indicators are widely variable and they are largely influenced by stress and the general condition of th e animals.

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