Genetic and physiological aspects of bulls of dual-purpose and beef breeds and their crossbreeds

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Abstract. The results of a study of hematological parameters of bulls from the Simmental (group I) and Limousin (group II) breeds and their crossbreeds of different generations are given: ½ Limousin ½ Simmental (group III generation I), ¾ Limousin ¼ Simmental (group IV generation II), 7/8 Limousin 1/8 Simmental (group V generation III) in summer and winter seasons. It was established that the total protein content in blood serum of calves from groups I and IV increased in summer period by 5.40 g/l (7.9%) and 2.01 g/l (2.9%) compared with winter season. n insignificant decrease in the studied indicator was noted in young animals of other groups. The concentration of albumin in blood serum of bulls from experimental groups was like a change in the content of total protein. The change in the total amount of globulins in blood of bulls with different genotypes was not the same. So, in summer compared to winter, their number in calves of the Simmental breed increased by 2.09 g/l (5.6%), and in Limousins and crossbreeds it decreased by 0.53 g/l (1.4%) and by 0.85-5.02 g/l (2.2-13.8%). It was established that the crossbreed bulls had more intensive process of increasing aminotransferase activity than purebred young animals.

1. Introduction
In most regions of Russia, beef production is carried out by raising livestock of dairy and dual-purpose breeds. And in the near future they will remain the main source for increasing meat resources.

At the same time, the development of beef cattle breeding is an important reserve for increasing the production of high-quality beef. In this regard, the use of genetic potential of the Simmental and Limousine cattle in pure and crossbreeding is of considerable interest in beef cattle breeding [1, 2]. The Simmental breed of cows is a popular type of cattle that cattle breeders began to breed actively in the early 17th century. The Limousin breed of cows has gained wide popularity among world breeders due to its beef productivity and the highest quality of meat. In addition, in Russia such cattle are also used to improve the characteristics of many local varieties. Simmental cows are bred in Russia, Ukraine, Kazakhstan and Belarus. This was facilitated by excellent acclimatization qualities, unpretentiousness to feeding and maintenance conditions [3-7].

The results of blood morphological and biochemical composition analysis were within the physiological limits in experimental bulls [4-9]. At the same time, the origin and genotype of young
animals had not a significant impact on the intergroup differences in hematological parameters. This testifies to the good adaptive abilities of the studied groups bull-calves [8-10].

2. Materials and Methods

Recently, much attention has been paid to the use of resource-saving technologies in the production of beef, which can reduce costs and thus improve the performance of beef cattle industry.

Being in various keeping conditions, body of animal is constantly experiencing the influence of various environmental factors in the process of its growth and development. The physiological functions of animal undergo changes with age and under the influence of many other factors. Important signs characterizing the physiological state of animals are blood indicators. In this regard, we studied the hematological parameters of Simmental (group I), Limousine (group II) breeds, and their crossbreeds of different generations: Limousin ½ Simmental (group III generation I), ¾ Limousin ¼ Simmental (group IV generation II), 7/8 Limousin 1/8 Simmental (group V generation III). Young animals were kept using beef cattle breeding technology.

3. Results and Discussion

Blood composition is characterized by relative stability, which ensures the maintenance of species, breed and individual peculiarities of the constitution of animals. At the same time, it changes under the influence of various factors, genetic and seasonal. It was established that the content of red blood cells in blood of Simmental bulls increased in summer compared with winter period by 2.78 x 10^{12}/l (55.8%), limousin peers by 2.4 x 10^{12}/l (41.7%), crossbreeds of the 1st generation by 2.53 x 10^{12}/l (38.4%), crossbreeds of the 2nd generation by 2.68 x 10^{12}/l (46.9%), crossbreeds of the 3rd generation by 3.20 x 10^{12}/l (60.6%). The increase in hemoglobin level was 9.33 g/l (8.2%), 9.00 g/l (6.9%), 7.60 g/l (5.7%), 17.33 g/l (13.9%), 21.33 g/l (17.8%) respectively. Decrease in blood leukocyte saturation was within the range 0.65 - 2.82 x10/l (9.3–50.6%).

In terms of blood saturation with hemoglobin, the advantage of the Limousins and crosses over the Simmentals is registered both in summer and in winter. In summer, this superiority was 14.67–18.67 g/l (P <0.001), and in winter 6.0–19.0 g/l (P <0.001). A similar trend was established by the content of red blood cells. Intergroup differences in blood leukocyte counts were insignificant and statistically unreliable.

At the same time, the change in the content of corpuscles and hemoglobin in blood did not go beyond the physiological standard and was due to the stress of physiological functions in the body of growing young animals.

An analysis of the data obtained by us indicates certain intergroup differences both in the content of total serum protein and in its individual fractions (table 1). In summer, the Limousin bulls and crossbred peers of the 1st and 3rd generation were characterized by the minimum level of total protein. This indicator of Simmentals and crosses of the II generation is slightly higher in the analyzed period of year. In winter, the opposite trend was established. The content of total serum protein of bulls from groups I and IV increased in summer period by 5.40 g/l (7.9%) and 2.01 g/l (2.9%) compared with winter. In young animals of other groups, an insignificant decrease of the studied indicator was noted.

Albumins are main types of proteins involved in metabolism and regulating this process. Change in albumin content of blood serum of experimental bulls was of a similar nature to the change in the total protein content.

A decrease in its level in summer was observed in animals of the Limousine breed and in crosses of the first generation, it amounted to 1.01 g/l (3.1%) and 2.61 g/l (7.9%), respectively. An increase in albumin in summer was observed in the Simmental bulls of group I and in crossbreeds of groups IV and V compared with winter period by 3.31 g /l (10.7%), 2.85 g /l (9.5%) and 0.5 g /l (0.5%). At the same time, intergroup differences in both total protein and albumin levels are insignificant and statistically unreliable.
The protein content of blood serum of bulls, g / l (X ± Sx).

| Group | Indicator | Winter | | | Summer |
|---|---|---|---|---|---|
| | Total protein | albumin | Globulins | | |
| | | | total | α | β | γ |
| I | 68.40 ±0.06 | 30.90 ±0.25 | 37.50 ±0.41 | 12.30± 0.47 | 9.91± 0.18 | 15.29± 0.69 |
| II | 72.50±1.66 | 34.14±2.10 | 38.36± 2.94 | 12.12± 0.98 | 9.92± 0.77 | 16.32± 2.11 |
| III | 76.97±4.98 | 35.69±0.81 | 41.28± 3.25 | 11.64± 0.29 | 12.29± 0.62 | 17.35± 3.43 |
| IV | 69.83±0.53 | 29.85±0.28 | 39.98± 0.80 | 11.70±0.46 | 11.82±0.24 | 16.46± 0.94 |
| V | 72.87±1.62 | 31.58±1.26 | 41.29± 1.78 | 10.95±0.94 | 12.81± 0.31 | 17.53± 0.76 |

Change in the total amount of globulins in blood of bulls with different genotypes was not the same. Therefore, their number increased by 2.09 g / l (5.6%) in calves of the Simmental breed and in Limousins and crossbreeds it decreased by 0.53 g / l (1.4%) and by 0.85-5.02 g / l (2.2-13.8%) in summer compared to winter.

Thus, a decrease in the albumin concentration was observed at a low atmospheric temperature, and the maximum amount was recorded in spring period of the year. The variability of globulin content was opposite to that of the albumin fraction. In this case, the influence of feeding level and feed quality on the fluctuations in the concentration of serum total protein and its fractions was noted, which agrees with numerous studies [11-13].

Transamination processes carried out by aspartate aminotransferase (AST) and alanine aminotransferase (ALT) by the reversible process of transferring amino group of amino acids to keto acids is an important link in protein metabolism of animal’s body.

An analysis of the dynamics of transaminase activity indicates certain intergroup differences (table 2).

| Indicator | Season | Group | | | |
|---|---|---|---|---|---|
| | | I | II | III | IV | V |
| AST | Winter | 1.50±0.14 | 1.42±0.08 | 1.78±0.05 | 1.45±0.11 | 1.45±0.15 |
| | Summer | 1.89±0.07 | 1.68±0.07 | 1.90±0.05 | 1.83±0.03 | 2.13±0.15 |
| ALT | Winter | 0.61±0.06 | 0.58±0.09 | 0.68±0.12 | 0.67±0.03 | 0.60±0.08 |
| | Summer | 0.98±0.11 | 0.93±0.11 | 1.06±0.03 | 1.09±0.03 | 1.14±0.02 |

It was found that with age, regardless of breed, this indicator increased in bulls of all groups in summer. It is characteristic that during this period young animals were distinguished by the highest growth rate for whole time of rearing.

Moreover, the process of aminotransferases activity increasing in crossbred bulls was more intense than in purebred young animals. So, in summer, compared with winter, the activity of AST in purebred bulls of groups I and II increased by 0.26-0.39 mmol/h * l (18.3-26.0%) and in crossbreeds
by 0.12-0.68 mmol/h \* 1 (6.7-46.9 %). A similar trend was observed in the dynamics of alanine aminotransferase activity.

4. Conclusion
Although all morphological and biochemical parameters of bulls were characterized by rather high lability, in all cases they did not go beyond the physiological standard.

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