Influence of para-aminobenzoic acid on young cattle

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ABSTRACT
In the present developmental state of market economy the agricultural sector of Russia has to increase the production of agricultural products. It is one of the most important tasks. This depends on the sustainable development of livestock industries and their intensification based on modern achievements. The agro-industrial complex and its basic type of economic activity - agriculture - are the leading system-forming spheres of the economy of the Chuvash Republic, which form the agri-food market, food and economic security, labour and settlement potential of rural territories. One of the tasks of the Chuvash Republic State program “Development of agriculture and regulation of the market of agricultural products, raw materials and food of the Chuvash Republic” for 2013-2020 is to stimulate the growth of production of main types of agricultural products and food products. A prerequisite for increasing agricultural production is increasing livestock productivity. The experience of using biological stimulants and feed additives under qualified use, with a predetermined task and in optimal quantities, indicates a rather high economic efficiency and safety for animals and humans. Research has been conducted to study the effect of para-aminobenzoic acid on the quality of meat in young cattle. The experiments were carried out in the educational experimental farm of the Chuvash State Agricultural Academy. Three young cattle groups were formed, having fifteen in each. The control group received the main diet, to the first experimental group, para-aminobenzoic acid was added to the main diet at a dose of 0.5 mg per 1 kg of live weight, the second experimental group – 1 mg per 1 kg of live weight. An organoleptic assessment of the quality of meat and meat broth indicates the biological usefulness of the meat of bull-calves treated with para-aminobenzoic acid. The chemical composition of the meat of bull-calves does not change significantly with the use of this vitamin.

INTRODUCTION
Increasing the production of high-quality livestock products is a problem that does not lose its relevance over the years, but is increasingly gaining importance both with the growth of the population...
of our planet, particularly in our country, and the satisfaction of humanity’s need for food (Khristoforovich et al., 2016; Smolentsev et al., 2018).

Meat and meat products contain a complex of highly valuable nutrients. They are the main supplier of proteins because they contain amino acids vital for building the tissues of the human body, which are well balanced and provide complete synthesis of tissue proteins (Semenov et al., 2018).

Fats in meat determine the high energy value of meat products, participate in the formation of their aroma and taste, and contain a sufficient amount of polyunsaturated fatty acids (Anatolieva et al., 2016; Ilyasovich et al., 2016; Egorov et al., 2018). There are extractive substances in muscle tissue. A man receives with meat and meat products all the minerals he needs. Meat food is especially rich in phosphorus, sulfur, iron, sodium, potassium (Matveeva et al., 2015; Dmitriyevich et al., 2016).

In recent years, biologically active substances have played an important role in the development of the livestock industry. Para-amino benzoic acid is an under-studied vitamin. To date, for young farm animals, the norm of consumption of this vitamin (H1) has not been established (Valiullin, 2017; Popov et al., 2018).

To accelerate the growth and development of young cattle, we suggest adding para-amino benzoic acid to their diet. This vitamin activates the entire intestinal flora, prompting it to produce folic acid.

The aim of this work is to study the effect of para-amino benzoic acid on the quality of meat of young cattle.

The following tasks have been laid in this regard:

1. To study the dynamics of growth and development of young cattle with use of para-amino benzoic acid in doses of 0.5 mg and 1 mg per 1 kg of live weight in the diet;

2. To study the effect of para-amino benzoic acid on the quality of meat of young cattle.

Para-amino benzoic acid is a natural chemical compound from the group of vitamin-like substances. Vitamin H1 is involved in the process of protein absorption.

**MATERIALS AND METHODS**

Research experiments were carried out in the educational experimental farm of the Chuvash State Agricultural Academy of the Chuvash Republic. In the course of research, three groups of young cattle were formed on the principle of analogue groups of 15 animals each: a control group and two experimental groups.

Young ones were selected considering the clinical and physiological state, breed (black-and-white), age, live weight at birth. Cows were selected considering the clinical and physiological state, breed (black-and-white), terms of pregnancy, live weight.

The experiments were carried out against the background of balanced animal feeding according to diets developed on the farm, taking into account the norms of feeding cattle. The control group received the main diet; for the first experimental group, para-amino benzoic acid was added to the main diet at a dose of 0.5 mg/kg of live weight, for the second experimental group – 1 mg/kg of live weight. In the experimental groups, para-amino benzoic acid was added to similar dry doses to pregnant dry cows in the experimental groups.

**RESULTS AND DISCUSSION**

The results of the study of live weight with the diet of vitamins H1 are presented in Table 1.

The average live weight of young cattle at birth in the second experimental group is 1.09% higher than in the first experimental group. And the same indicator in the first experimental group increased by 4.5% compared with the control group. The growth results from the use of para-aminobenzoic acid in the first experimental group compared with the control group increased on an average by 7.5–9.5%, in the second – up to 10.5%.

One of the distinctive features of the development of animals is the uneven growth of not only the body as a whole, but also of individual parts of the body, organs and tissues, which leads to various changes in physique at different ages. In the course of the experiment, we measured some parameters of the exterior: oblique body length, height at the withers, chest circumference behind the shoulder blades and metacarpus circumference.

Oblique body length, height at the withers, chest circumference behind the shoulder blades and metacarpus circumference of animals in the control and experimental groups sequentially increased during the observation process.

Analysis of the data shows that when feeding the drug at a dose of 0.5 mg per 1 kg of live weight, the indicators of exterior measurements in the first experimental group increased by an average of 7.9% compared with the control group.
Table 1: Growth dynamics of young cattle

| Duration of observation, d | Control group | I experimental group | II experimental group |
|---------------------------|---------------|---------------------|----------------------|
| At birth                  | 35.3±0.62     | 36.9±0.70**         | 37.3±0.98*           |
| 15                        | 44.9±1.41     | 49.2±1.43**         | 50.1±1.98**          |
| 30                        | 55.8±1.68     | 61.1±1.71**         | 62.8±1.98**          |
| 45                        | 67.4±1.85     | 73.2±1.88**         | 75.5±2.28**          |
| 60                        | 79.1±2.38     | 86.2±2.48**         | 89.3±2.98**          |
| 90                        | 102.5±2.92    | 112.1±3.42**        | 115.7±3.99**         |
| 120                       | 125.3±3.22    | 134.9±3.30**        | 136.9±3.28**         |
| 150                       | 148.1±3.48    | 159.0±3.78**        | 162.8±3.90**         |
| 180                       | 170.9±4.52    | 185.3±4.94**        | 188.8±4.86**         |

*P<0.05; **P<0.01

Table 2: Results of organoleptic assessment of meat and meat broth

| Group     | Appearance | Cutaway Color | Indicators, score | Average score |
|-----------|------------|---------------|-------------------|---------------|
|           |            |               | Score             |               |
|           |            |               | Aroma | Taste | Consistency | Juiciness | Richness |
| Control   | 7.8±0.3    | 8.0±0.3       | 7.9±0.2 | 8.1±0.2 | 7.7±0.2 | 7.5±0.2 | - | 7.8 |
| meat      | 7.6±0.2    | 7.7±0.2       | 7.7±0.2 | - | - | - | 7.5±0.2 | 7.7 |
| broth     | 7.9±0.2    | 8.1±0.2       | 8.0±0.2 | - | - | - | 8.0±0.2 | 8.0 |
| I experimental | 7.9±0.2 | 7.9±0.2       | 7.8±0.2 | 8.0±0.2 | 8.2±0.2 | 7.7±0.2 | - | 8.0 |
| meat      | 7.8±0.2    | 8.1±0.2       | 8.0±0.2 | - | - | - | 8.0±0.2 | 8.0 |
| broth     | 7.9±0.2    | 8.2±0.2       | 8.1±0.2 | - | - | - | 8.1±0.2 | 8.1 |
| II experimental | 7.8±0.1 | 7.9±0.1       | 7.8±0.2 | 8.4±0.2 | 8.2±0.2 | 7.8±0.2 | - | 8.0 |
| meat      | 7.9±0.2    | 8.2±0.2       | 8.1±0.2 | - | - | - | 8.1±0.2 | 8.1 |
| broth     |           |               |                   |               |

Table 3: The chemical composition of the meat of bull-calves

| Parameters  | Control | I experimental | II experimental |
|-------------|---------|----------------|-----------------|
| Moisture, % | 74.25±0.12 | 74.08±0.12 | 74.07±0.13 |
| Ash, %      | 1.90±0.02  | 1.95±0.01  | 1.95±0.02  |
| Protein, %  | 18.90±0.08 | 18.76±0.08 | 18.85±0.09 |
| Fat, %      | 2.86±0.01  | 2.92±0.01  | 2.94±0.02  |

When determining body type and comparing the exterior of animals, body indices were calculated. When calculating indices, we took measurements that were anatomically related to each other, characterizing the proportions and development of the animals.

The stretch index at the end of the experiment is higher compared to the control: in the first experimental group – by 1.43%, in the second – by 2.80%. The blockiness index decreases slightly (by 1.76% in the first experimental group and by 2.66% in the second relative to the control) and the bone index increases (by 2.80% in the first experimental group and by 3.42% in the second in relation to the control).

At the end of the experiment, an organoleptic assessment of the quality of meat, meat broth and biochemical analysis of meat were conducted. When determining the quality of meat, the results of organoleptic evaluation are often final and decisive (Table 2). The main advantage of such assessment is the ability to quickly and simultaneously identify a complex of organoleptic characteristics of the prod-
uct: color, taste, aroma, consistency, juiciness, etc. The meat was tasted after heat treatment (boiling). In addition, the quality of the broth was evaluated.

Samples of meat were taken from different carcasses, but always from the same site. For boiling, meat of a thick edge is used in the region of 6-8 thoracic vertebrae, pieces weighing about 1 kg without stripping from surface fat. While assessing the quality of cooked meat and broth, pieces of meat were put in a pan with cold water (water to meat ratio 1:3), covered with a lid, brought to a boil and cooked for 1.5 hours. Half an hour before the end of cooking salt was added – 1% of the weight of the water. After cooking, the meat was removed from the broth and cooled to 30-40 °C. The cooled meat was cut into slices of 50 grams for each taster. Meat was evaluated according to the following indicators: appearance, aroma, taste, consistency (hardness, tenderness), juiciness. The broth was poured into glasses (approximately 50 ml) and the appearance, colour, aroma, taste, richness were determined. To eliminate the taste sensations arising from previous samples, it was necessary to remove sensory fatigue. All evaluation results were recorded in special tasting lists. Each indicator had 9 degrees of quality.

Organoleptic assessment of the quality of meat and meat broth from bull-calves between the control and experimental groups did not have significant differences. However, slight differences were noted in the assessment of taste, consistency and juiciness. Taste qualities of meat of the first and second experimental groups were higher by 0.3 points, which amounted to 8.4 ± 0.2 points (in the control 8.1 ± 0.2 points). The meat consistency of the experimental groups were 8.2 ± 0.2 points against 7.7 ± 0.2 points in the control group. The richness of meat broth in the second experimental group was also higher by 0.6 points (8.1 ± 0.2) than in the control group (7.5 ± 0.2), and in the first experimental group higher than the control by 0.5 points.

Analysis of the results show that the moisture content in the meat of bull-calves of the second experimental group is lower by 0.17%, in the second experimental group - by 0.18% than in the control group. No significant differences in the ash content between the groups were observed. The protein content is subject to a slight difference, and the fat is higher in the first and second experimental groups compared with the control by 0.06% and 0.08%, respectively (Table 3).

CONCLUSIONS

As a result of our theoretical and experimental studies, we showed a positive effect of para-amino benzoic acid on the growth and development of young cattle. By analyzing the average live weight of young cattle at birth and the dynamics of their growth, we can come up with the conclusion that there was no significant difference between these indicators in the first and second experimental groups. Therefore, it is advisable to use para-amino benzoic acid at a dose of 0.5 mg per 1 kg of live weight.

Organoleptic assessment of quality of meat and meat broth indicates the biological usefulness of the meat of bull-calves treated with para-amino benzoic acid. The chemical composition of the meat of bull-calves with the use of para-amino benzoic acid does not change significantly.

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