The influence of “Therapeutic and preventive immunoglobulin” immunostimulant on the veterinary and sanitary assessment of meat and the histological features of the parenchymatous organs of cattle

S Yu Smolentsev¹, R Kh Ravilov², F K Achmetzyanova², A S Gasanov² and E L Kuznetsova²

¹Mari State University, Yoshkar-Ola, Russia
²Kazan State Academy of Veterinary Medicine, Kazan, Russia

E-mail: lady.firaya@bk.ru

Abstract. The aim of the research is to study the effect of “Therapeutic and preventive immunoglobulin” immunostimulant on the veterinary and sanitary assessment of meat and the histological features of the parenchymatous organs of cattle. The study showed that pH of the meat in the experimental group was 5.32±0.03, in the control group – 5.43±0.02, the level of amine ammonia nitrogen – 1.19±0.02 and 1.21±0.01 mg in the experimental and control groups, respectively. The peroxidase reaction was positive both in the experimental and control groups, the reaction with copper sulfate was negative. The copper content was 34% more in the experimental group than in the control group (1.80±0.03 mg/kg). The concentration of zinc was 38.5±1.32 and 23.1±0.98 mg/kg in the experimental and control groups, respectively. The levels of iron were similar in the experimental and control groups. The cobalt content in the meat of calves in the experimental group was 24.6% higher than in the control group. The concentration of selenium and magnesium in the meat of calves in the experimental group was higher than in the control group. Such heavy metals as lead, cadmium, mercury and arsenic were not found in the meat of the calves in the experimental and control groups. According to the results of the histological study, the drug does not cause pathological changes in the structure of the liver, kidneys, myocardium, lymph nodes and spleen.

1. Introduction
The use of manufacturing technologies in cattle breeding supposes applying new methods of keeping, feeding and exploitation that cause the increase in the number of livestock, potentially pathogenic microorganisms in the premises, the change in their original properties, the impact of technological stress factors on animals, poor ecological situation, shortage of feed trace elements. To confront such new challenges veterinarians should take measures to protect animal health [1-3].

The effect of these factors influences the adaptive mechanisms in animals that leads to a decrease in nonspecific resistance and immunity or increase in reactivity [4-5].

Disorders of the immune system are one of the pathogenetic mechanisms of any pathological process [6-7].
Currently the assessment of the immune status of animals which depends on their age, physiological condition, effect of pathogenic factors that cause diseases and the possibility of its correction with drugs with antioxidant and indirectly immunomodulatory effects is relevant [8].

In foreign countries, immunostimulants are used to treat acute infectious and oncological diseases [9-10].

One of the new drugs with immunostimulating effect is “Therapeutic and preventive immunoglobulin” manufactured by FGBU “Federal Center of Toxicological, Radiation and Biological Safety” (Russia, Kazan).

The drug is made from the serum of horses and represents an immunologically active protein fraction that contains primarily G immunoglobulins which have high biological activity due to the ability to sorb native molecules of immunoglobulins, enzymes, hormones and other proteins, it increases bactericidal activity and plays a significant role in antiviral immunity.

The aim of the research is to study the effect of immunostimulant “Therapeutic and preventive immunoglobulin” on the veterinary and sanitary assessment of meat and the histological features of the parenchymatous organs of cattle.

2. Experimental part

The study was carried out on the cattle farm “Iskra” in Kuzhenersky district of the Mari El Republic. The calves of black-motley breed were divided into two groups of 5 animals. A live weight of each calf was 420 kg. The drug “Therapeutic and preventive immunoglobulin” was administered to the animals of the first group intramuscularly at a dose of 20 ml twice with an interval of 48 hours. Animals of the second group served as a control and were kept on a normal diet.

30 days after the start of the experiment 3 animals from each group were slaughtered. For veterinary and sanitary assessment 2 samples of meat (10 cm long) were taken from the flexors and extensors of the breast and hip bones of the carcass. Each sample of meat was wrapped in plastic film.

pH, the level of amine ammonia nitrogen, zinc, copper, iron, cobalt, selenium, magnesium, lead, cadmium, mercury, arsenic were determined in the meat. The peroxidase reaction and the reaction with copper sulfate were carried out to determine the freshness of meat.

To carry out histological study, 3 samples of 2x4 cm were taken from the liver, kidneys, myocardium, lymph nodes and spleen. Pathological material was placed in a vessel with a 10% aqueous solution of formalin. Then the samples of the tissues were poured with paraffin of 55°C and left for 2 hours. Thereafter, histological sections of 5-7 µm thick were made with the microtome and stained with hematoxylin-eosin.

The study of the structure of tissues and cells of the organs was conducted with the Leica DM 1000 microscope. Pictures were taken with the Nikon coolpix 4500 digital camera.

3. Results and considerations

Organoleptic studies have shown that the meat of animals in the control and experimental groups had a dry pale pink crust. The section was uneven with more blood than in other places of carcass, the meat was tough, elastic, when pressing it with a finger the deepening was formed which leveled off quickly. Muscles in the section were slightly damp, did not leave a wet spot on a filter paper and were light red.

There was no blood in the muscles and blood vessels, the small blood vessels under the pleura and peritoneum were not seen. The surface of the section in lymph nodes was light gray.

Meat broth was transparent and fragrant, on its surface there was a small amount of large fat droplets. The taste of the broth was nice without any off-flavors.

The tendons were elastic, tough, the surface of joints was smooth and shiny.

In impression-smears taken from the deep muscles, isolated cocci and rod-shaped bacteria were visible under the microscope.

The slaughter weight in the experimental group was 4.3% higher than in the control group. The dressing percentage was 62.6±2.43% in the experimental group and 56.8±1.55% in the control group.
Table 1 shows that pH of the meat in the experimental group was 5.32±0.03, in the control group – 5.43±0.02, the level of amine ammonia nitrogen – 1.19±0.02 and 1.21±0.01mg in the experimental and control groups, respectively.

The peroxidase reaction was positive both in the experimental and control groups, the reaction with copper sulfate was negative that indicates high quality of the meat.

| Indicators                  | Groups       |
|-----------------------------|--------------|
| pH                          | Experimental | Control     |
|                             | 5.32±0.03    | 5.43±0.02   |
| Amine ammonia nitrogen, mg  | 1.19±0.02    | 1.21±0.01   |
| Peroxidase reaction         | positive     | positive    |
| Reaction with copper sulfate| negative     | negative    |

Table 2 shows that the copper content was 34% more in the experimental group than in the control group (1.80±0.03 mg/kg). The concentration of zinc was 38.5±1.32 and 23.1±0.98 mg/kg in the experimental and control groups, respectively.

| Indicators                  | Groups       |
|-----------------------------|--------------|
| Copper, mg/kg               | Experimental | Control     |
|                             | 1.80±0.03    | 1.34±0.02   |
| Zinc, mg/kg                 | 38.5±1.32    | 23.1±0.98   |
| Iron, mg/kg                 | 462.7±12.8   | 451.1±9.11  |
| Cobalt, µg /100g            | 9.51±0.32    | 7.63±0.26   |
| Selenium, µg /100g          | 2.27±0.04    | 1.41±0.03   |
| Magnesium, mg/kg            | 170.5±8.21   | 151.9±5.39  |
| Lead, mg/kg                 | Not found    | Not found   |
| Cadmium, mg/kg              | Not found    | Not found   |
| Mercury, mg/kg              | Not found    | Not found   |
| Arsenic, mg/kg              | Not found    | Not found   |

The levels of iron were similar in the experimental and control groups. The cobalt content in the meat of calves in the experimental group was 24.6% higher than in the control group.

The concentration of selenium and magnesium in the meat of calves in the experimental group was higher than in the control group. Such heavy metals as lead, cadmium, mercury and arsenic were found in the meat of the calves neither in the experimental group nor in the control group.

Histological study has shown that the cardiac muscle is made of cardiac muscle tissue which consists of cardiomyocytes. Stroma consists of layers of fibrous unformed connective tissue that are feebly marked.

The lymph nodes are darker in the cortical substance and lighter in the brain substance. Cortical substance of a node is composed of rounded follicles which are round mass of lymphocytes in the reticular tissue. Lymph cords spread outward from the cortical substance, the net of which form the medullary substance – ribbon-like mass of lymphocytes in the reticular tissue. There is a capsule at the periphery of the section made of connective tissue with fat lobules.

In the liver, there is a slight amount of connective tissue separating the lobules and accumulating mainly along the vessels at the edges of the lobules. Lobulation is seen in the radial location of the plates around central veins. The wall of the central vein is formed by the endothelium and subendothelial layer of connective tissue. Hepatic cords spread radially outward from the central vein of the hepatic lobule. Hepatocyte nuclei are round, of various sizes. The walls of the intralobular capillaries are almost invisible, but nuclei of the endothelium of the capillaries are clearly visible.

The kidneys are surrounded by the capsules made of fibrous connective tissue. Renal tubules are seen in the cortical substance which are cut in various directions and form a renal labyrinth in which
glomeruli are seen. Renal tubules are made of a single layer of epithelial tissue. Brain rays pass into the cortical substance, the tubules of which are cut along; tubules of the loops predominantly pass in the brain rays, and in the deeper parts they are joined by the initial parts of the collecting ducts. The medulla consists of straight tubules of collecting ducts.

In the spleen, the follicles are globular clusters of lymphocytes in the reticular tissue which forms the basis of the spleen. There are central arteries in follicles. The capsule of the spleen is made of connective tissue. Trabeculae spread outward from the capsule. There are blood vessels in the sections, trabecular arteries. All the space between the capsule, trabeculae and malpighian bodies is the red pulp made of reticular tissue.

4. Conclusion
The study showed that pH of the meat in the experimental group was 5.32±0.03, in the control group – 5.43±0.02, the level of amine ammonia nitrogen – 1.19±0.02 and 1.21±0.01 mg in the experimental and control groups, respectively. The peroxidase reaction was positive both in the experimental and control groups, the reaction with copper sulfate was negative. The copper content was 34% more in the experimental group than in the control group (1.80±0.03 mg/kg). The concentration of zinc was 38.5±1.32 and 23.1±0.98 mg/kg in the experimental and control groups, respectively. The levels of iron were similar in the experimental and control groups. The cobalt content in the meat of calves in the experimental group was 24.6% higher than in the control group. The concentration of selenium and magnesium in the meat of calves in the experimental group was higher than in the control group. Such heavy metals as lead, cadmium, mercury and arsenic were not found in the meat of the calves in the experimental and control groups that meets requirements for high quality meat.

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