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Article

Pharmaco-Toxicological Determination of Biostimulators

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Abstract: This article studied the pharmacological effects and safety level of a preparation produced from trout liver on the organism of rabbits. The preparation was added to the feed for a specified period, and the live body weight of the animals was regularly monitored. It was determined that the rabbits in the second experimental group showed a significant increase in body weight, as well as effective stimulation of metabolism and physiological processes.

Keywords: Biostimulator, Trout Liver, Live Body Weight, Pharmaco-Toxicological Determination

Introduction

Biostimulators are substances of natural or synthetic origin that stimulate physiological processes in living organisms. They activate metabolism, enhance immune system activity, and accelerate growth and regeneration processes. From a pharmacological perspective, the mechanism of action of biostimulators is characterized by the activation of cellular energy metabolism, stimulation of mitochondrial enzyme systems, and enhancement of antioxidant defense mechanisms [1]. In recent years, natural and synthetic biostimulators have been widely used in veterinary practice. Determining the safety level, therapeutic index, pharmacodynamic, and pharmacokinetic properties of these substances is of great importance. Today, biostimulators are extensively applied in veterinary medicine to activate the natural defense mechanisms of the organism, normalize metabolism, and increase productivity. However, pharmaco-toxicological determination is essential for evaluating their safety level and physiological mechanisms of action [2].

Research Objective

The aim of this study was to determine the pharmacological activity, safety level, and long-term effects of natural and synthetic biostimulators on the organism of rabbits [3].

Purpose of the Study

To analyze the pharmacological properties of biostimulators, determine their effects on the physiological parameters of rabbits, identify hematological changes, and evaluate their toxicological safety [4].

Materials and Methods

Clinically healthy rabbits weighing 2.5–3 kg were used in the study. The animals were kept under special conditions (22±2 °C, 12-hour light regime, high-quality feed, and free access to clean water). The experiments were carried out in accordance with pharmacopoeial articles, the recommendations of the State Scientific Center for Quality Control and Circulation of Veterinary Medicines and Feed Additives, and the "Ethical Guidelines for Animal Experiments." The effects of biostimulators on the physiological parameters of rabbits were studied using healthy, non-albino rabbits of both sexes weighing 2.5–3 kg and maintained on a complete ration diet [5]. Ten rabbits were selected for the experiment. Each rabbit was housed individually in cages under constant temperature conditions. Room temperature fluctuations were controlled not to exceed +3°C. During cage cleaning and weighing procedures, special care was taken to avoid stress conditions in the animals by preventing noise and sudden movements [6].

During the week preceding the experiment, the rabbits were monitored to ensure that they did not lose body weight. The animals were weighed every other day, three times a day, before feeding. Rabbits showing weight loss were considered unsuitable for the experiment. No weight loss was observed in the experimental rabbits [7].

For three days before the experiment, the body temperature of each rabbit was measured. Temperature measurements were taken every morning before feeding using a DT-624 electrothermometer with an accuracy of ±0.1°C. The thermometer probe was inserted 2–3 cm into the rectum (depending on the rabbit's body weight) for the time required to reach the maximum temperature. The initial body temperature of the control group rabbits was 38.8±0.03°C, while the experimental rabbits showed an initial body temperature range of 38.7±0.2°C [8].

In addition, rabbits used for testing the medicinal preparation for the first time were checked for reactivity according to the pharmacopoeial standards accepted within the republic by intravenous administration of a sterile non-pyrogenic 0.9% sodium chloride solution at a dose of 10 cm^3/kg. Temperature fluctuations of up to +0.3°C were observed in the experimental rabbits. Animals showing a temperature increase greater than +0.4°C were considered unsuitable for the experiment.

Eighteen hours before the experiment, the rabbits were transferred to a room intended for pyrogenicity testing. The experiment was conducted in a quiet, noise-protected room with a stable temperature differing by no more than +2°C from the housing room temperature, while fluctuations during the test did not exceed ±2°C. On the evening before the experiment, the remaining feed was removed from the cages. The animals were not fed before or during the experiment, although water was provided ad libitum [9].

The tested preparation produced from trout liver was administered to the rabbits. Before administration, the rabbits' temperatures were measured twice at 30-minute intervals. The last recorded temperature was accepted as the baseline temperature. The preparation was administered 15 minutes after the final temperature measurement. Following administration of the tested preparation, the rabbits' body temperatures were monitored every 15 minutes for one hour.

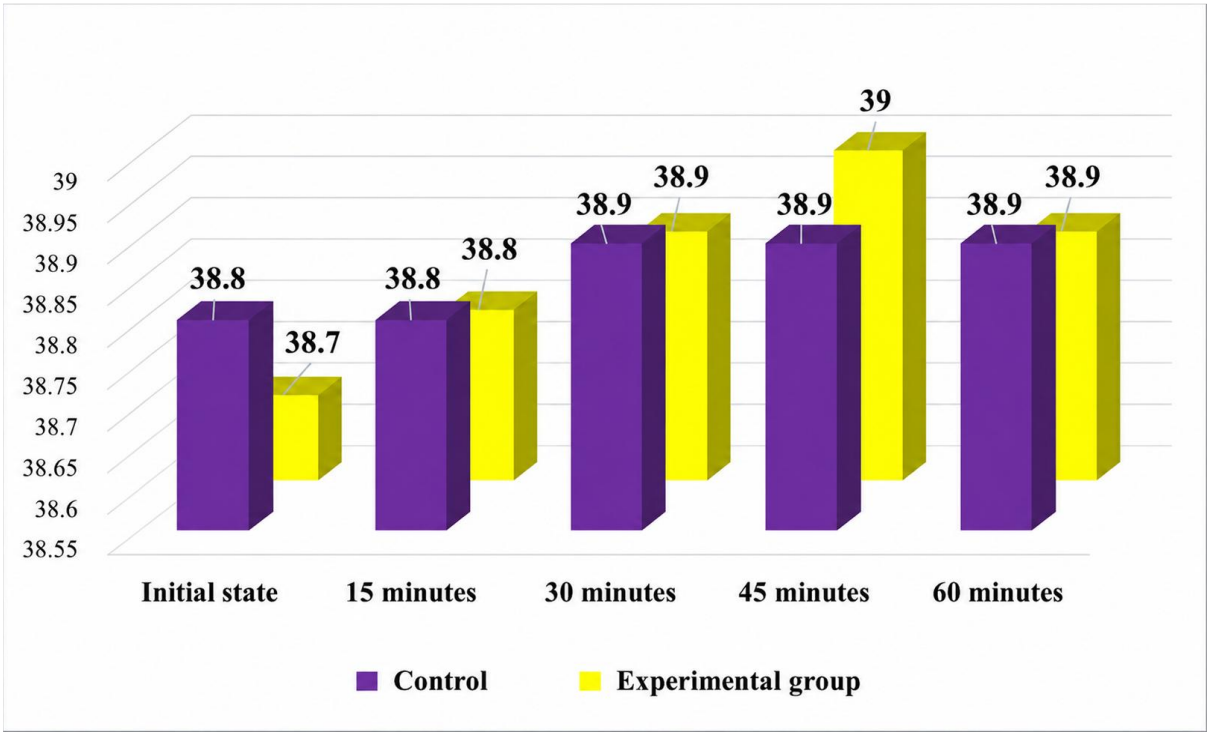

Figure 1. Determination of the Effects of Biostimulators on the Physiological Parameters of Rabbits (n=10)

Results and Discussion

When the tested tissue preparation was administered to rabbits in accordance with the established requirements, an average increase of 0.3°C in body temperature was observed in the experimental animals [10].

To determine the effect of the preparation produced from trout liver on the body weight gain of rabbits, a total of 15 rabbits were selected and divided into three groups. Rabbits in the first experimental group received the trout liver-based preparation at a dose of 30 mg/kg, while rabbits in the second experimental group received 40 mg/kg mixed with feed for 20 days. The rabbits in the third (control) group did not receive the preparation [11-13].

During the study, changes in body weight were regularly monitored by weighing the rabbits before administration of the preparation and again on days 3, 5, 10, 15, 20, and 25.

According to the data presented in Table 1, three days after administration of the preparation to the experimental groups, the live body weight of rabbits in the second experimental group was 32 g or 1.48% higher than that of the control group, while in the third experimental group this indicator was 33 g or 1.52% higher.

On the 5th day of the study, the difference in live body weight between the experimental and control groups continued to increase. In the second experimental group, body weight increased by 51 g or 2.31% compared to the control group, whereas in the third experimental group this показатель increased by 85 g or 3.85% [14].

Table 1. Changes in the Live Body Weight of Rabbits (kg) (n=15)

Periods	**Animal groups**		
	Experimental group I	Experimental group II	Control group
Before administration of the preparation	2,080±0,061	2,090±0,076	2,100±0,054
After 3 days	2,190±0,59	2,191±0,081	2,158±0,072
After 5 days	2,258±0,87	2,292±0,061	2,207±0,083

After 10 days	2,398±0,71*	2,481±0,073*	2,283±0,069
After 15 days	2,484±0,63*	2,591±0,051**	2,326±0,76
After 20 days	2,532±0,86*	2,706±0,65**	2,394±0,62
After 25 days	2,614±0,75*	2,827±0,93**	2,478±0,59

Note: ** p<0,01; * p<0,05

A significant difference in live body weight was recorded on day 10 of weighing, particularly in the second experimental group of rabbits. According to this indicator, rabbits in the second group showed a body weight that was higher than that of the control group by 198 g or 8.67%, respectively. In the remaining observation periods, the rabbits in the second experimental group also consistently demonstrated higher values compared to the control group [15].

At the end of the experiment, an increasing trend in live body weight was observed in all groups of rabbits. However, the growth rate of rabbits receiving the trout liver-based preparation at a dose of 40 mg/kg showed a noticeable decline after 20 days. This trend was also observed on day 25. By the 25th day, the growth of rabbits in the second experimental group was higher than that of the control group by 349 g or 14.08%.

Conclusion

Based on the experimental results, the use of the trout liver-based preparation at a dose of 40 mg/kg demonstrated a higher growth performance in rabbits compared to the control group. From the 10th day onward, the growth of rabbits in the second experimental group increased significantly compared to the control animals, and by the 25th day it was higher by 14.8%.

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