

ARTICLE

METHODS FOR HEMATOGENESIS STIMULATION IN CATTLE

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ABSTRACT



The paper presents experimental data on changes in hematological parameters during daily feeding of calves (aged 3.5-4 months, weighing 120 kg) with phytopreparation – coniferous energy supplement in doses of 25, 50, and 100 ml per animal, which was used for 30 days. It was found that the phytopreparation has hematopoietic (especially erythropoietic) properties – it led to pronounced stimulation of the increase of red blood cell count and hemoglobin level in the blood and normalized the hematocrit and the level of platelets (plateletcrit). It was noted that a dose of 50 ml per animal per day stimulated these processes more intensively. The research showed that a new method can be used for stimulation of erythropoiesis in cattle, which would allow to stimulate cattle erythropoiesis due to the effective erythropoietic characteristics of the components of the original coniferous energy supplement. As a result, the treatment expense for animals can be reduced due to the absence of the need for expensive medications and the simplicity of use.

INTRODUCTION

KEY WORDS
erythropoiesis, blood,
red blood cells,
hemoglobin,
hematopoiesis, cattle,
coniferous energy
supplement

The intensive development of animal agriculture largely depends on the improvement of the technology of veterinary measures through the introduction of new methods and means of prevention and treatment of animal diseases. The progress of veterinary pharmacology is facilitated by the constant research and creation of new highly effective and safe drugs [1-4]. Known methods for correcting the hematopoietic status of animals are based mainly on stimulation of hematopoiesis, use of medication (for example, medicines containing iron, cobalt, and copper), or intramuscular and subcutaneous administration of stabilized allogeneic or heterogeneous blood, as well as non-specific globulin and polyglobulin. These methods of treatment of anemia and anemic syndromes and prevention of anemic conditions in animals have several disadvantages: the complexity of the drug administration, the high cost of medicines and complexity of treatment using them, as well as certain contraindications and limitations. They are complex in execution and not effective enough to stimulate the red lineage of hematopoiesis in animals [5]. In recent years, much attention has been given to medications and natural supplement feeds, which have high bioavailability and accessibility and are used to normalize physiological processes in animals. Their sustainability, economic efficiency, and the absence of any side effects (including addiction) are also important [6-8].

The study aimed to develop a method for stimulating red hematopoietic lineage (including erythropoiesis) in cattle.

MATERIALS AND METHODS

Experiments with animals were conducted in accordance with the “Rules for the use of experimental animals” (annex to the order of the Ministry of Health of the USSR dated 08.08.1977 No. 755). A coniferous energy supplement (CES) was obtained using the technology of processing wood leaves based on the extraction of biologically active substances with a new selective extractant (manufactured by the Scientific and Technical Center (STC) “KHIMINVEST” LLC, Nizhny Novgorod) [8]. The CES is a homogeneous viscous liquid with a distinct coniferous smell, olive green or dark green in color. Water content is less than 50%, pH is 8.0-9.0, density is not lower than 1,126, and mass fraction of carotene per 100 g of the extract is not lower than 3 mg%. Studies of the chemical composition of the CES showed that it contains vitamins B1, B2, B3, B5, B6, B9, as well as carotenoids and many other biologically active compounds. The energy value of CES is 250 kcal/100 g. Acerous leaves contain cobalt, copper, manganese, zinc, and iron (which play an important role in the formation of blood cells), chlorophyll and xanthophyll (which play an important role in the metabolism), a large number of phytoncides, sugar, glucose, fructose, pectin, and tannins. The additive in the form of the finished product was supplied by the STC “KHIMINVEST” LLC.

The STC “KHIMINVEST” LLC, jointly with the Ogarev Agrarian Institute of Moscow State University, developed a unique technology for processing wood leaves based on the extraction of biologically active substances with a new selective extractant. The extractant is non-toxic, allows one to improve the performance properties of the products, and has antibacterial properties, ensuring the preservation of properties of products for a long period. The developed technology is one-stage, waste-free, sustainable,

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and has lower energy costs. The technology for the production of CES includes: 1) extractant, 2) mincing of wood leaves, 3) extraction of biologically active substances, 5) coniferous energy supplement.

The studies were conducted on calves owned by the Bolotnikovskoye LLC of the Lambirsky District of the Republic of Mordovia. The duration of the experiment was five months (the cattle were fed with the additive for one month and observed for changes in blood parameters for four months). According to the principle of analogues, four experimental groups of animals were formed (five animals per group). Of these, the first, second, and third groups were experimental and the fourth group was control.

For the experiment, animals of around the same age (3.5-4 months) were selected. They were clinically healthy and were kept in similar conditions and fed the same diet. At the beginning of the experiment, individual weighing of animals and morphological blood tests were carried out. Every day for 30 days, animals (age: 3.5-4 months, weight: 120 kg) of the first, second, and third experimental groups received the original CES in doses of 25, 50, and 100 ml per animal, respectively. Animals of the control group did not receive the CES. The effectiveness of the original CES was analyzed using clinical observation and hematological parameters. Hematological studies were conducted at the veterinary clinic of the Agrarian Institute using a MICROCC-20Vet (HTI, USA) automatic hematology analyzer for veterinary medicine. Digital data was processed using parametric statistical methods; the degree of reliability was determined using the Student t-test using the Microsoft Excel (2000) and STAT 3 software.

RESULTS AND DISCUSSION

There were no deviations from the physiologically normal state in the calves, the appetite remained high, and the clinical status was stable during the four months of observation after feeding the original CES. The original CES did not cause negative consequences for the clinical condition of animals, while it was noted that the calves' appetite was improved. The use of the CES in the diet led to a significant (10-23%) increase in meat productivity.

The red blood cell count in all experimental calves was within normal limits, or significantly higher than normal [Fig. 1]. It was also established that the use of the CES at a dose of 50 ml per animal significantly stimulated an increase in the level of hemoglobin in the blood [Fig. 2]. In addition to erythropoietic properties, the CES normalized hematocrit, platelet count, and plateletcrit. Fig. 1 and 2 show the changes in the red blood cell count and hemoglobin level in the blood of experimental animals after feeding them with CES. Further studies showed that similar changes were noted in cows that received the CES in doses up to 250 ml per animal.

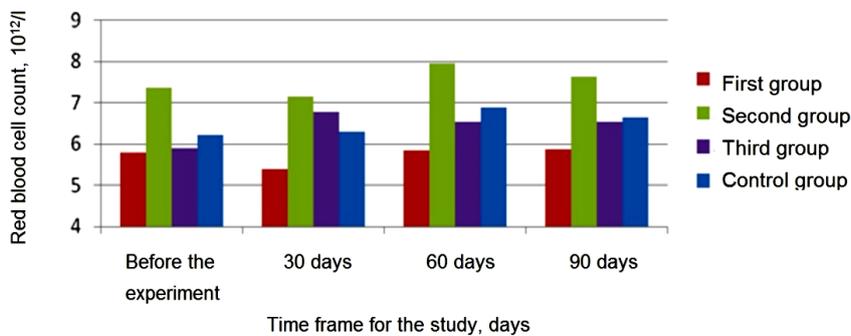


Fig. 1: The effect of the use of the CES in different doses on the red blood cell count in calves

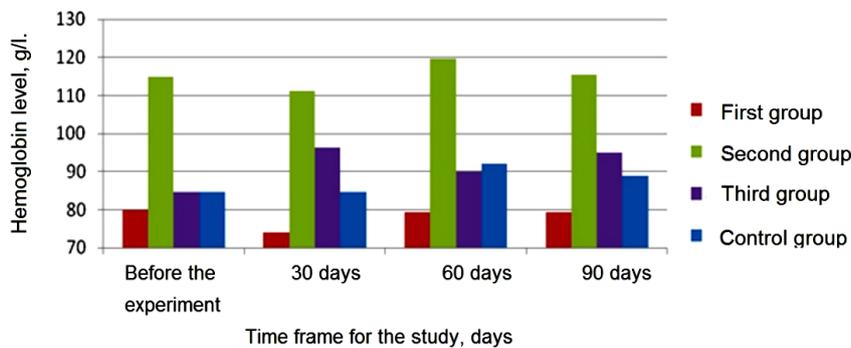


Fig. 2: The effect of the CES in different doses on the level of hemoglobin in the blood of calves

Studies showed a significant increase in the red blood cell count and hemoglobin level in animals that used CES. The increase in the parameter in the second group (the most indicative) averaged 31.7%, compared to the control. This indicates that the phytopreparation showed hematopoietic properties. Consequently, the phytopreparation showed hematopoietic (erythropoietic) properties, led to an increase of red blood cell count and hemoglobin level. It was noted that the dosage of 50 ml of CES per animal per day stimulated these processes more intensively.

Compared with the commonly used solution, the proposed method allows one to increase the stimulation of erythropoiesis of cattle due to the effective hematopoietic properties of the components of the original CES. At the same time, the cost of treating animals is reduced due to the lack of expensive medication and simplicity of use.

The results of this study allowed us to determine the most effective dosage of the drug – 50-100 ml per animal per day. The results are consistent with previous studies on calves and cows with the use of phytopreparations [9-10]. This stimulating hematopoiesis method has real prospects for practical veterinary medicine.

CONCLUSION

A unique technology for processing wood leaves based on the extraction of biologically active substances with a new selective extractant has been developed. The phytopreparation has a commercial name – coniferous energy feed supplement, for which technical conditions have been developed and a certificate of conformity have been received. Modification of cattle with a natural drug leads to reduction of the cost of treating animals with nutritional anemia, diseases accompanied by anemic symptoms that arose in the setting of a weakening of the hematopoietic function of the red bone marrow, as well as age-related, physiological (pregnancy), and acquired anemia, and reduction of the cost of prevention of anemic conditions and correction of anemic syndromes. The tested method of stimulating hematopoietic function of the red bone marrow in cattle involves daily feeding calves with CES at a dose of 50-100 ml per animal for 30 days. With the introduction of CES, the profitability of production reaches 25%.

CONFLICT OF INTEREST

The authors declare no competing interests in relation to the work.

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FINANCIAL DISCLOSURE

None.

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