BIOLOGICALLY ACTIVE PREPARATIONS AND REPRODUCTION INDICES IN DAIRY COWS

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Abstract

The biologically active preparation under the symbolic name "Bison" was administered to pregnant cows for a period of 150 days (60 days before calving and 90 days after calving) 20 ml/head/day. As a result of the research it was found that the cows in the experimental group had no complications in calving, the first estrus manifested after 27.3 days, each cow was seeded as a result in the first estrus, spending only 2 doses of frozen semen, while in the cows from the control group, which did not receive the preparation "Bison", the first estrus manifested after 36.2 days, each cow was inoculated 1.75 times, spending on average 3.5 doses of M.S.C. for a gestation of a cow. Fertility was 2 times lower in the control group (50%) than in the experimental group (100%). Thus, the administration of the nominated preparation, cows in the last 2 months of gestation and the first 3 months after calving, in the amount of 20 ml/head/day, led to a decrease in the number of artificial inseminations for a gestation by 0.75 units, to a decrease in semen costs by 1.5 doses/cow, and to an increase in fertility by 50%.

Key words*: cows, fertility, preparation, semen.*

INTRODUCTION

For the last period of gestation, highly productive dairy cows must be prepared not only to give birth to healthy and vigorous calves but also for milk production in the future lactation. It is also very important at the same time to maintain the health of the cow in order to achieve this productivity. At dairy cows with high productivity in the postpartum period, disorders of the reproductive system are quite common. These disorders are characterized by heat delay, repeated artificial insemination, increased length of service period, which in turn lead to higher semen costs, decreased fertility and reproductive capacity, length of calving-interval and as a result decreased amount of milk per lactation. Causes of reproductive disorders are many and varied, but it is established experimentally by several researchers, that the main cause is the so-called phenomenon of dominance of the milk production process in large quantities, which in turn inhibits to some extent other systems and processes including and the reproductive system. This dominance depends not only on the breed of cows, but also on other technological factors such as maintenance systems, methods of exploitation, etc. For the normalization of reproductive processes at cows with high milk production, animal owners use different methods and procedures, starting with the use of medicines and preparations to stimulate heat, improve maintenance conditions, improve nutrition, up to the formation of breeds and lines of animals with characteristics normal reproductive system. The selection of cows according to their reproductive characteristics is a procedure that is still practiced today in the breeding farms of some economic agents. In the research undertaken by several scientists, in terms of improving the reproductive qualities of lactating cows in the postpartum period, the methods of improving nutrition by introducing in animal rations food stimulants from the spectrum of premixes, probiotics, prebiotics, other micro- and macro elements supplements are predominant. These additives acting as nutritional stimulants, concomitant also act as stimulators of other metabolic processes, including animal reproductive processes, thus

influencing the natural resistance of the body as a whole. At the same time, we mention the fact that the influence of these preparations on the metabolic, energetic processes, of the reproductive functions of the highly productive cows, requires in-depth and detailed studies that remain still current (Misailav, 1976; Mihailov, 1976; Șacalov, 1956).

Approaching this topic, through the prism of abundant nutrition, and trying to balance and ensure the ration with the full range of nutrients in the postpartum period is a desideratum of the purpose of diminishing the reproductive problems of the highly productive dairy cows during this period.

An imperative significance has the composition and origin of the preparations used as stimulators of the metabolic processes in the body of cows (Rusakov, 2015; Yarmots et al., 2019). In order to improve the reproductive indices of dairy cows, we initiated an experimental research based on the use in animal feed of biologically active preparations synthesized from the residues of the beer production industry. The experimentally active biological preparation presents an extract of natural products, a concentrate of amino acids, micro- and macroelements, enzymes, ferments, other biologically active substances, which should, beneficially influence the reproductive processes of high-yielding dairy cows both during pregnancy and in the postpartum period (Sinelschikova et al., 2020).

MATERIALS AND METHODS

For the development of experimental research, 2 groups of cows with 5 heads in each group were selected. The cows at the beginning of the research were in the 7th month of gestation and the experiments were extended after calving for another 3 months, so the total experimentation period lasted 150 days. During this period, the cows from the experimental group were administered the biologically active preparation "Bison", in liquid form, in an amount of 20 ml/ head/day. This dose of the preparation was included in the ration once a day during the administration of the combined fodder. Both groups of animals (control and experimental) received identical rations throughout the experiment. During the research, the course of calving, the absence or presence of complications at calving and after were monitored, and some reproductive indices that appeared at animals in the postpartum period were further calculated and analyzed. Thus, the period of manifestation of the first estrus, the duration of the service period, the number of artificial inseminations performed until obtaining the gestation, the conception rate, the expenses of semen for a fertile insemination, etc. were established. In order to establish the influence of the biologically active preparation on the blood indices, blood samples were taken from all cows included in the research. Subsequently, the assessment and analysis of blood indices were performed, which characterize some changes and modifications in the metabolism of the cow's body during the experiments. Urea, triglycerides, glucose, amylase, total protein, albumin, alkaline phosphatase (ALP), creatinine, calcium, phosphorus and magnesium were studied in blood serum samples using the StatFAX semi-automatic biochemical analyzer with special ELITech putties.

RESULTS AND DISCUSSIONS

A calf must be obtained from each cow in a calendar year, so that the interval between two consecutive calvings "*calving-interval*" must not exceed 12 months. To obtain this result, the cow must be sown in the first 3 months after calving. This result can be obtained only if the calving proceeds normally, the reproductive organs become involved and return to normal in a short period, and the first estrous cycle occurs 25-35 days after calving. Subsequently, when the cow for various reasons is not sown in the first estrus, the estrous cycles are repeated regularly at intervals of 18-21 days. Experimental research began in the last 2 months of gestation to monitor the effects of the biologically active preparation on the course of calving, the manifestation of estrous cycles and the results of artificial insemination in the postpartum period. After completing the experimental research, the data obtained were processed and analyzed to assess the effects obtained. At cows from the experimental group, complications during gestation were not detected. At the end of gestation, it was found

that the calving of the cows in the experimental group took place normally, without any complications or help from the veterinarian. Were born healthy, viable calves that were later included in the technological process of raising young. For the last 2 months of gestation in the control group were observed deviations from the normal behavior and health of a single cow, which was expressed by the restlessness of the cow, decreased appetite, looking for a place more separate from other cows. Later, this cow had serious complications during calving and was rejected for this reason. In 4 other cows of this group, the last 2 months of gestation went normally, there were no complications during calving and after. After calving, at cows with high milk production, all the body's metabolisms are mainly directed towards fulfilling a single goal: stimulating the milk production processes. In most cases, the activation of these processes is detrimental to other functions that are quite vital during this period, such as the involution of the reproductive organs and their return to normal. Because of this, is slowed down this recovery and the period of manifestation of the first estrus is extended. The manifestation of estrus in the postpartum period at cows of the experimental lot was after 27.3 days after calving, and in the control group after 36.2 days. The duration of the service period was by 8.9 days longer at cows in the control group than at those in the experimental group. Concidering that the first estrus at cows involved in research manifested itself in a fairly short time after calving, when the reproductive organs have not yet returned to normal, the cows in both lots in this intentional estrus were not inseminated. Until the manifestation of the next estrus, at most cows the reproductive organs returned to normal and were prepared for artificial insemination.

In the second estrous cycle each cow in the experimental group was inseminated as a result only once. All cows in the control group were artificially inseminated in the 2nd estrus, and three of them were repeatedly inoculated in the 3rd estrus. Thus, the number of inoculations of cows in the control group was higher due to the repeated inoculation of 3 cows in the third estrous cycle. As a result, in the experimental lot 4 inseminations (4 cows) were performed, one insemination per cow, and in the control lot 7 inseminations (4 cows) 1.75 inseminations per cow (Table 1).

Table 1. Reproductive indices of cows

No	Indices	Control group	Experimental group	+,- by control
1	Duration of service period, days	36.2	27.3	-8.9
2	Insemination for a gestation	1.75	1.0	-0.75
3	Fertility, %	50.0	100.0	+50.0

Two doses of frozen semen are spent on each artificial insemination of the cows. Because in the control group several inoculations were performed on one cow, or several doses of semen were spent for the artificial insemination of a cow - 3.5 doses, while in the experimental lot where each cow was inoculated only one given, were spent only 2 doses. Fertility was by 2 times lower in the control group (50%) than in the experimental group (100%), considering that the cows in the experimental group became impregnate after the first insemination, and some cows in the control lot became impregnate after the second insemination.

As a result of experimental research on the study of the new biologically active preparation, synthesized by researchers from the Institute of Microbiology and Biotechnology in brewer's yeast, it can be said that the nominated preparation used in feeding of impregnate cows positively influences some aspects of reproductive indices in the postpartum period. Thus, the administration of the nominated preparation to cows in the last 2 months of gestation and the first 3 months after calving, in the amount of 20 ml/head/day, leads to a decrease in the number of artificial insemination by 0.75 units/cow, reduces semen costs by 1.5 doses/cow, and increases fertility by 50%. During the experiment, in order to have a broader picture of the metabolic processes carried out during this time, blood samples were taken from the cows in the study.

Blood plays a very important role in the body of animals, ensuring the exchange of substances in the cells and tissues of all organs. Blood biochemical indices characterize metabolic processes as disturbances of these processes influence blood indices (Gromyko, 2005; Kazartsev, 1986; Danilov, 2008)

The metabolic processes of the animal organism are reflected on blood indices that

change quantitatively, depending on their physiological state, and can characterize the situation in which the animal is at the moment. In order to detect the changes of some blood indices that may occur following the administration of the biologically tested active preparation, blood samples were taken and analyzed from all cows in the research. Blood samples were taken at the beginning and end of the experiment, the blood indices obtained are presented in Tables 2 and 3.

Blood indices throughout the research in both lots were within the normative limits, regardless of the physiological stage in which they were. Following the analysis of blood indices at the end of the experiment, quantitative differences were found between the experimental and control groups in most of the analyzed substances. These differences are explained by the fact that the cows at the end of the research were in another physiological stage, namely at the top of the lactation curve.

Table 2. Blood indices of cows at the beginning of the experiment

Indices	Group	
	Experimental	Control
Ca, mmol/l	12.8±2.3	16.7±3.3
P, mmol/l	2.9±0.4	2.8±0.4
Mg, mmol/l	2.5±0.5	3.4±0.6
Protein, g/l	50.8±6.9	44.3±3.8
Albumin, g/l	19.9±2.9	29.2±1.6
Creatinine, mmol/l	104.1±25.2	101.8±29.8
Urea, mmol/l	5.5±0.9	8.3±1.0
Glucose, mmol/l	5.4±0.8	4.2±0.5
Triglyceride, mmol/l	1.3±0.4	0.7±0.1
Cholesterol, mmol/l	172.5±69.0	90.0±9.7
Amylase, u/l	165.5±17.8	129.8±19.3
Alkaline phosphatase, u/l	64.0±17.7	67.3±24.3
Fe, mkmol/l	0.8±0.1	0.9±0.1

Table 3. Blood indices of cows at the end of the experiment

Indices	Group	
	Experimental	Control
Ca, mmol/l	8.2±0.5	13.0±2.00
P, mmol/l	0.6±0.1	0.3±0.04
Mg, mmol/l	0.9±0.2	1.4±0.60
Protein, g/l	12.3±2.2	15.9±2.82
Albumin, g/l	11.0±2.3	8.4±0.96
Creatinine, mmol/l	36.4±25.7	48.8±13.71
Urea, mmol/l	0.3±0.0	0.4±0.04
Glucose, mmol/l	3.2±0.1	3.0±0.25
Triglyceride, mmol/l	3.1±0.1	3.3±0.14
Cholesterol, mmol/l	380.4±22.5	378.7±20.08
Amylase, u/l	11.9 ±3.8	10.8±2.81
Alkaline phosphatase, u/l	6.4±1.5	13.4±3.35
Fe, mkmol/l	3.6±1.2	3.7±0.48

Thus, at the end of the experiment, at the cows from the experimental group there was a decrease in the level of protein, albumin, urea, glucose, Ca, P, Mg, amylase, alkaline phosphatase, compared to those in the control group.

The conglomerate of listed substances, participates intensively in milk production, by intensifying the metabolic processes to ensure the vital functions of all organs including those involved in milk synthesis. The amount of protein in the blood is an important indicator of metabolism in the body of the cow being the fact, that proteins ensure the functioning of all vital and productive organs of the animal. In the case of our experience, the decrease in protein levels from 50.8 g/l to 12.3 g/l in the blood indicates the rapid increase in milk production, which was found during this period. The final products of protein breakdown, urea (from 5.5 - to 0.3 mm/l) and creatinine (from 104.1 - to 36.4 mm/l) also decreased.

An increase of the level of triglycerides in both lots of cows in the postpartum period indicates an increase and accumulation of energy in the body. This can be qualified as a preparation of cows for the next physiological period, ie for the activation of the reproduction processes and the installation of the next gestation. Also, this quantitative increase in triglycerides contributes to some extent to an improvement in the immune system, which in turn ensures good health for cows. The elements calcium and phosphorus in the postpartum period, decreased in both groups due to the elimination from the body through the produced milk, remaining at the same time, as mentioned above, within the normative limits.

The results show that the biologically active preparation "Bison", included in the ration of pregnant cows in the last 2 months of gestation and the first 3 months after lactation, had a positive influence on many metabolic processes of the body. The results regarding the improvement of reproductive indices, the birth of healthy and viable calves, the increase of milk production, are visible and in our opinion, it is largely due to the biologically active preparation administered. In this context we see the need to analyze the content of the biologically active preparation experienced, in

order to explain some extent of this influence, on what factors it is based and how it acted. The detailed knowledge of the content of the preparation, the number and quantity of biologically active substances in the preparation, the quantitative proportions between substances, helped us to support our assumptions regarding the mechanism of influence. The latest research in human and animal physiology, both fundamental and applied, focus attention to the fact that the interaction between conglomerates of nutrients, micro and macroelements, vitamins, enzymes, hormones, ferments, etc., occur in certain periods of time and only with meeting all the beneficial factors. The lack of only one element of this chain at a certain time, can stop the previously triggered metabolic process, or the process can be directed elsewhere, sometimes with serious unfavorable consequences for the body. Given the fact that metabolic processes in the animal body are a component of the whole system functioning, regulation and ensuring the vitality of the animal, the inclusion of a preparation or nutrients in the ration of animals should be studied and analyzed only in complex with the whole system and reciprocal interactions of various processes. Of course, we are aware that in our rather small and limited conditions and capacities, it is almost impossible for such experimental research to study the integral vital system of the animal, and for this reason we have to limit ourselves to studying a very narrow segment of the process. metabolic food.

In many scientific papers (Bestujev, 1963; Schmidt, 1957; Oldham, 1987) the influence of only one element is studied, for example selenium or iodine, excluding somehow or placing in the background the influence of other substances that interact with the experienced elements. Of course, it is very difficult to find, select, synthesize such a nutrient or food additive that contains a conglomerate of elements that fully meet the requirements of the animal body, ensuring the normal functioning of all metabolic processes and vital organs. It is even more difficult to look for and determine such a nutrient that is of natural origin, with biologically active properties, without toxic ingredients, and without adverse influences.

Researchers from the Microbiology and Biotechnology Institute of the Republic of Moldova conducted studies and experimental research to search for, identify and select such a nutrient or food additive that is of natural origin, contains many valuable nutrients and is harmless. Studying several raw materials, including residues from industrial processing of crops, or identified products from the wine processing and brewing industry. As a result of the fermentation processes, wine and beer yeasts are obtained, which also served as raw material for the synthesis of the new biologically active preparation, under the conventional name "Bison", which was later studied, experimented and analyzed in experimental animal research. by researchers from the Scientific and Practical Institute of Biotechnologies in Zootechny and Veterinary Medicine.

The nominated preparation was obtained by extraction from yeast biomass of biologically active preparations of amino acid-protein, polysaccharide and lipid nature, and subsequently, following laboratory analyzes, it was established that this preparation contains a wide range of nutrients, proteins, carbohydrates, lipids, fatty acids, micro and macroelements, a wide variety of amino acids, a series of micro and macroelements, etc. This biologically active preparation synthesized from the residues of the food industry, with such a chemical composition of precious substances, experienced in our research on cows with high milk production, has led to quite positive results in improving reproductive indices.

In this context, we can assume that the experienced preparation contributes to some extent to ensuring the normal functioning of many vital organs of the animal body. The substances and elements in this preparation probably participate in the closely interconnected complex reactions that take place in the body, through the influence of nutritional factors on animal health. Perhaps this multitude of elements, some of which are found even in a smaller amount, can participate as catalysts, stimulators and triggers of other reactions and vital processes, as a result of which such substances are synthesized that are not even found in food, or in other preparations

administered to animals in various forms, but which are very necessary to ensure the health of the animal.

CONCLUSIONS

The biologically active preparation "Bison" administered to dairy cows positively influences reproductive indices in the postpartum period: the manifestation period of the first estrous cycle is reduced; decreases the number of artificial inseminations to obtain gestation by 0.75 units/cow; reduces semen costs by 1.5 doses/cow; increases fertility by 50%.

The parameters of the blood indices undergo non-essential changes between the groups of animals following the administration of the preparation "Bison"

The biologically active preparation "Bison" administered to dairy cows contributes to increasing the immune resistance of animals and as a result to maintaining their health.

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