



## Influences of Biologically Active Substances on Some Parameters of Pig Breeding in the Treatment of Postpartum Endometritis

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### Abstract

The use of the developed and proposed by us biologically active substances drugs do not have a negative impact on the sows' productivity and contribute to the improvement of some reproductive indicators. Thus, the litter weight increased by 4.75 and 5.55 times higher, which is by 3.12% and 20.05% more, compared with the control, and the offspring survival rate by 4.74% and 1.17% more than in the control. The data obtained will allow improving and specifying the appropriate preventive, therapeutic, diagnostic, and other measures necessary to increase the sows' reproductive potential.

**Disciplinary:** Veterinary, Zoology, Biotechnology.

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## 1 Introduction

In the past decades, the demand for environmentally friendly food, in particular meat and meat products, has been increasing in the world. In connection with such dynamics, the main task of cattle breeding is to intensify herd reproduction and maximize cattle productivity [1].

In this regard, swine husbandry is quite a promising branch of cattle breeding, since pigs are fast-growing animals with a large offspring's quantitative yield and a high average daily increase in live weight [2].

## 2 Literature review

As in any enterprise, there are also different problems in this farm sector. One of them is that the sows' productivity still averages about 40-60% of their potential [3]. Today, on average, the sows' effective prolificacy often does not exceed 60-70%, and the infertile sows account for 10-25% of the main herd [4]. Because modern industrial swine breeding technologies do not always take into account the physiological needs of the pig organism formed in the animals during phylogeny, this leads to a weakening of the immune system, an increase in the frequency of various pathologies, including various postpartum diseases, in particular endometritis. Therefore, to increase the overall pig's organism resistance, therapy, and prevention of postpartum pathologies in the conditions of modern swine breeding to increase the reproductive capacity and pigs' reproductive potential, it is necessary to pay more attention to not only the fodder conversion efficiency and timely medical-preventive activities, but also to increase the overall organism resistance in general [5]. Etiotropic therapy drugs are most often used. However, almost all of them have certain drawbacks: toxic effect on the organism, irritating effect on tissues, long-term effects and various side effects, resistance to antibiotics [6,7].

Therefore, veterinarians aspire to limit the frequency of antibiotic use by replacing them with drugs that do not potentiate antibiotic resistance, have immune-stimulating properties and contain environmentally friendly and inexpensive components.

Currently, there is a wide range of such components: vitamins, trace nutrients, protein-mineral-vitamin complexes (PMVC), nonsteroidal anti-inflammatory drugs (NSAIDs); enzyme preparations, medications from animal and plant tissues, including a class of biologically active substances (BAS) - biostimulators that have unique biological properties [8,9]. Such drugs are effective because the micronutrients or extracts of medicinal plants contained in them have good antibacterial and bactericidal, and sometimes fungicidal, immune-stimulating, and antiviral properties [10].

BAS is not specific either in species or histologically. They affect the whole body in general. Activate metabolism, tissue regeneration, and energy organism processes. The overall organism reactivity and the functional state of the reticuloendothelial system are increased, the gastric glands' work is activated and the immunobiological organism activity is enhanced, the processes of gas exchange, glycolysis, phosphorus metabolism, hematopoiesis, cardiovascular activity, respiration, and other vital functions of the organism are stimulated [11].

BAS also contributes to the improvement of reproductive characteristics. For example, selenium in addition to its antioxidant function is very important in increasing the fertilizing ability of sperm [12]. Glutathione Peroxidase II (GPX-II) is a tissue enzyme in large quantities included in mammalian spermatids, performing a structural and enzymatic role. There are several

types of selenoproteins in the sperm head, which neutralize peroxide and oxygen radicals. In the neck of the sperm, selenoprotein (PH-GSN-Px) acts as an antioxidant and a structural function. Selenium and iodine are interrelated, with a lack of selenium, hyperproduction of the thyroid-stimulating hormone causes thyroid hyperplasia, deiodinase activity of the first type decreases, the level of T4 in peripheral tissues increases, and the level of T3 decreases, exacerbating iodine deficiency and thereby causing various pathologies, including teratozoospermia, oligospermia and several other pathologies [13,14].

Most components of BAS or BAS derivatives, micro-and macro elements, nutrients are supplied to all tissues and organs with blood flow, and metabolic products are excreted with it. Therefore, the study of biochemical and hematological parameters of blood during the use of BAS is of great diagnostic importance [9,15]. This is because even an incomplete hematological and biochemical blood test helps a specialist to determine with high accuracy, not only the general condition of the organism but other characteristics. Such studies make it possible to make the right decision about the expediency of using biological stimulants in a given situation, identify hidden pathologies, predict the disease outcome, proofread therapy, and monitor the effect of the drugs used. Therefore, during the treatment of chronic diseases or pathologies with a long period of therapy, with the external clinical signs absence, the blood test gives a complete picture of the organism's condition and allows controlling metabolic changes in the pig's organism [16,17]. It also reflects the effectiveness and expediency of using certain drugs, helps to correct treatment promptly and significantly reduces costs, and accelerates the restoration of the pig's reproductive functions.

It should be noted that although BAS in cattle breeding, and in particular swine breeding, has been used for a long time, the mechanism of action of such drugs is still insufficiently studied [18,19]. In this regard, a more thorough study of the effect on the organism and reproductive potential stimulation of both existing and new drugs from the BAS class is still relevant.

Our research aimed to study the effect of new medication (tissue drug and medications based on plant extracts in cyclodextrin with iodine) on some productivity parameters and a number of biochemical indicators of sow's blood in the treatment of postpartum endometritis.

### 3 Method

The studies have been conducted in the conditions of the Moldsuingibrid swine breeding and hybridization complex (Orhei, Republic of Moldova).

Sows with a diagnosis of postpartum endometritis have been selected from the number of farrowed sows. The selected queens have been divided into 3 groups: one control and two experimental.

In the control group, all sows were treated according to the scheme adopted by the farm: the drug enrofloxacin 50 was used according to the instructions - injections of 1 ml/20 kg of body weight, once a day, intramuscularly for 3-5 days.

The pigs of both experimental groups were injected once, in the upper third of the neck (behind the ear), with a tissue drug at the rate of 1 ml/100 kg of body weight (figure 1). Before use, the drug was diluted with 0.5% Novocain solution in the ratio of 1:1.



**Figure 1: Pigs' injection**

The sows of the first experimental group were intrauterine injected with 100-150 ml of the drug, which included the following components: iodine in combination with high polymers (chelated iodine) and an extract from the plant "G" of the Lamiaceae family.

The pigs of the second experimental group were intrauterine injected with 100-150 ml of the drug, which included iodine in combination with high polymers and an extract from the plant "C" of the Asteraceae family.

The multiplicity of intrauterine injections to sows was one time per day for 3-5 days.

The tissue medication was prepared in the laboratory of the Scientific and Practical Institute of Biotechnology in Animal Science and Veterinary Medicine. The manufacturing of the tissue drugs was conducted from organs and tissues of animal origin according to the modified N. Krause method.

The drugs administered intrauterine were manufactured in the conditions of the Moldsiungibrid farm. To produce these drugs medical plants and a mixture of 5% alcohol tincture of iodine in combination with high polymers were used (blue iodine prepared according to the V. Mokhnach recipe).

The choice of these resources for the study and application in the supervised farm conditions was made because earlier research conducted by us allowed establishing low sensitivity, and in some cases, complete antibiotic resistance to most of the antibiotics and chemotherapeutic agents used in the supervised farm.

The studied medications are effective due to the fact that:

- the trace elements and extracts of medicinal plants contained in them have good antibacterial, bactericidal and fungicidal, immunostimulating, and antiviral properties.
- iodine in combination with high polymers does not potentiate antibiotic resistance, has a detrimental effect on all types of microorganisms, fungi, bacteria, protozoa, etc.

Besides, it had been taken into account that iodine-containing resources are most effective in combination with the means of tissue therapy.

All the drugs used, their composition, and manufacturing techniques are under patent.

The sows' therapy was conducted until the complete disappearance of all clinical signs of postpartum endometritis in all groups.

The effect of the used drugs on some parameters of sows' productivity was determined by the following criteria: the interval from farrowing to insemination (days), the interval from hatching to insemination (days), prolificacy (heads, number of live piglets at birth), brood chambers weight at birth (kg), high yield (kg), milk production (kg) (brood chambers weight for 21 days), increase in litter weight for 21 days (times), offspring preservation for 21 days after farrowing, weight of one piglet in 21 days (kg), offspring preservation (%) by the time of weaning.

The following biochemical indicators level was determined in the serum of blood samples: protein, albumin, glucose, triglycerides, creatinine, urea, calcium, phosphorus, and iron.

## 4 Result and Discussion

The research results of the BAS effect on some productivity parameters during the treatment of postpartum endometritis in sows are presented in Table 1 and in Table 2.

The research results to determine the BAS effect on the main biochemical indicators of blood during the treatment of postpartum endometritis in sows are presented in Table 3.

Data analysis in Table 1 showed that after the studies, the interval from farrowing to fruitful insemination of sows in the experimental groups decreased by 5.5 and 6.4 days and amounted to  $61.5 \pm 8.10$  and  $51.6 \pm 5.95$  days. In the control group, the interval between farrowing and the insemination of sows was  $54.7 \pm 5.92$  days, which is 4.5 days less than before the studies.

**Table 1:** The BAS effect on some productivity parameters during the treatment of postpartum endometritis in sows

Group	Interval from farrowing to insemination (days)		Difference (days)	Interval from weaning to insemination		Difference (days)
	before treatment	after treatment		before experiment	after experiment	
Experimental I	$67,0 \pm 8,70$	$61,5 \pm 8,10$	5,5	$22,4 \pm 6,9$	$17,25 \pm 5,01$	5,15
Experimental II	$58,0 \pm 5,62$	$51,6 \pm 5,95$	6,4	$15,6 \pm 3,18$	$9 \pm 3,36$	6,6
Control	$59,2 \pm 7,24$	$54,7 \pm 5,92$	4,5	$20,8 \pm 5,04$	$18,8 \pm 4,93$	2

The interval from weaning piglets to fruitful insemination of sows (at their first arrival in heat) in the experimental groups decreased by 5.15 and 6.6 days and amounted to  $17.25 \pm 5.01$  and  $9 \pm 3.36$  days.

In the control group, the interval between weaning of piglets and insemination of sows was  $18.8 \pm 4.93$  days, which is 2 days less than before the studies.

Considering the results presented in Table 2, it can be seen that, during the research period, some parameters of reproductive potential fluctuated within:

- prolificacy - from  $9.1 \pm 0.744$  to  $11.125 \pm 0.586$  heads,
- brood chambers weight at birth - from  $10.61 \pm 0.547$  to  $13.73 \pm 0.931$  kg.,



- large-fruited - from  $1.1917 \pm 0.05$  to  $1.327 \pm 0.023$  kg.

**Table 2:** The main productivity indicators in various methods of postpartum endometritis therapy in sows.

Indicators	Groups		
	Control	Experimental I	Experimental II
Prolificacy (heads, number of live piglets at birth)	10,428±0,77	11,125±0,586	9,1±0,744
Litter weight at birth (kg)	13,73±0,931	14,725±0,577	10,61±0,547
Prolificacy (kg)	1,319±0,021	1,327±0,023	1,1917±0,05
Milk production (kg) (litter weight for 21 days)	63,285±6,707	70±5,24	58,93±6,1
Increase in litter weight for 21 days (times)	4,609	4,753	5,554
Offspring survival rate in 21 days after farrowing (heads)	8,571±0,701	9,75±0,562	7,7±0,685
Weight of one piglet for 21 days (kg)	7,334±0,249	7,138±0,30	7,6072±0,202
Offspring preservation at the time of weaning in 35 days (%)	82,9	87,64	84,615

In addition, during the research period, it was found that the sows' milk production in all groups ranged from  $58.93 \pm 6.1$  kg to  $63.285 \pm 6.707$  kg. In the experimental groups, the litter weight is 4,753 and 5,554 times higher, which is by 3,124% and 20.05% more than in the control group, where the litter weight is 4,609 times higher.

The offspring survival rate for 21 days after farrowing in all groups ranged from  $7.7 \pm 0.685$  heads to  $9.75 \pm 0.562$  heads in the litter weight.

At the time of weaning, the offspring survival rate was 82.9% in the control group, and by 4.74% and 1.175% higher in the experimental groups, and amounted to 87.64% and 84.615%, respectively.

Such fluctuations in indicators can be explained by the fact that tissue and iodine-containing drugs were used in the experimental groups, which, as it is known, have a growth-stimulating effect. In this case, it is an indirect growth-stimulating effect. Explained by the fact that tissue drugs (as it is known) stimulate the work of the neuroendocrine system and the whole organism, in this case, the milk productivity of sows and stimulation of the body's immune system. In addition, in the iodine-containing medications used by us for intrauterine administration, the biologically active form is a part of the polarized I<sub>2</sub> molecule and the oxyanion. It is this iodine in combination with high polymers that loses its toxicity and locally irritating effect on soft tissues, easily interacts with the cell membrane, does not irritate the uterine tissues, destroys pathogenic microflora, stimulates uterine tonus, which contributes to faster tissue cleansing and endometrial restoration. The iodine-containing plant extracts have an organic compound of the phenol monoterpenoids class, which are superior in their bactericidal properties to some antibiotics. In this connection, the purification of the uterine cavity from pathogenic microflora is accelerated, which also helps to shorten the therapy duration. It also contributes to a faster recovery of the sow, an increase in milk productivity, and an improvement in the quality and composition of milk.

Analyzing the blood metabolic profile indicators data presented in Table 3, it can be seen that all drugs were used in three groups (in one control and two experimental groups) (enrofloxacin, tissue drugs, medications containing medical plants extracts) did not hurt the pig's organism.

**Table 3:**The main biochemical indicators of sows' blood.

	Groups	Blood sample studies results		td
		Before the experiment	After the experiment	
Glucose, mmol/l	Experimental I	4.28±0.63	3.5±0.41	1,038
	Control	3.76±0.168	3.96±0.241	0,68
Triglycerides, mmol/l	Experimental I	0.728±0.153	1.72±0.382	4,64
	Control	1.008±0.075	1.52±0.201	2,392
Total protein, g/l	Experimental I	33.96±3.32	32.38±1.83	0,417
	Control	31.22±1.39	31.8±1.39	0,295
Albumin, g/l	Experimental I	16,8±2,86	17.3±0.96	0,1657
	Control	17.16±1.23	23.42±2.28	2,42
Creatinine, mkmol/l	Experimental I	124.8±18.53	76.46±19.46	1,802
	Control	136±43.62	142.06±52.13	0,086
Urea, mmol/l	Experimental I	1.498±0.51	2.18±0.507	0,984
	Control	1.724±0.302	1.946±0.418	0,431
Ca, mmol/l	Experimental I	4.32±0.85	6.064±1.56	0,981
	Control	4.46±1.21	4.66±1.39	0,108
P mmol/l	Experimental I	1.008±0.054	0.794±0.144	1,391
	Control	0,386±0.12	0.476±0.16	0,45
Fe mmol/l	Experimental I	0.572±0.78	0.275±0.0249	0,378
	Control	0.368±0.019	0.132±0.037	5,67
	Experimental II	0.451±0.46	0.239±0.02	0,460

All biochemical sows blood indicators are within the limits of physical standards in all groups.

Besides, the data obtained allowed us to establish that the BAS developed and proposed by us has a positive effect on some productivity characteristics and main biochemical blood indicators during the treatment of sows postpartum endometritis.

Such changes can be explained by the fact that a tissue drug was also used in the experimental groups. Tissue drugs are known to have not only a growth-stimulating effect but also indirectly stimulate the immune system, moderately stimulate metabolism. As indicated by a drop in creatinine levels and a slight increase in urea levels as one of the metabolism rate indicators. This in turn accelerates the production of antibodies (as indicated by an increase in the level of albumin), and, therefore, the recovery time after the survey is shortened and the sow comes to heat faster after weaning piglets.

The obtained data allowed us to establish that the developed and investigated BAS drugs, when used in the treatment of sows' postpartum endometritis, do not have a negative impact on the sows' productivity and contribute to the improvement of some reproductive indicators.

## 5 Conclusion

In the course of therapy of sows' postpartum endometritis using new drugs, it has been found that the brood chambers weight increased by 4.75 and 5.55 times, which is 3.12% and 20.05% more, compared with the control. the offspring preservation by 4.74% and 1.17% more than

in the control and the developed and proposed for use BAS class drugs do not have a negative impact on the sows' productivity.

The data obtained will allow to improve and specify the appropriate preventive, therapeutic, diagnostic and other measures necessary to increase the reproductive potential of sows.

## 6 Availability of Data And Material

Data can be made available by contacting the corresponding authors.

## 7 Acknowledgement

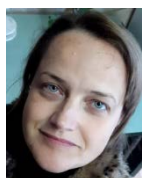
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