

## TREATMENT OF BACTERIAL VAGINOSIS BY NATURAL MEDICINES

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The work was aimed at substantiating the possibility of using biocomposites from natural healing resources of Kyrgyzstan and electroactivated mineral water for the treatment of inflammatory diseases of the genitourinary sphere in women. On three randomized groups of women with bacterial vaginosis, the effectiveness was compared: 1 – an anolyte from highly mineralized chloride calcium-sodium mineral water, 2 – vaginal tampons including dried leaves of Kalanchoe, Hypericum, marigold, juniper fruits, dried sea buckthorn fruits, sage, chamomile, nettle, Melissa, mint, thyme, calendula, citric acid, Chon-Tuz salt, 3 – win candles with clotrimazole. It is shown that the floral-salt composition for vaginal tampons developed on the basis of natural medicinal resources of Kyrgyzstan has antibacterial, anti-inflammatory, anti-allergic and regenerative effects. Electrochemical activation of mineral water makes it possible to obtain an anolyte rich in free chlorine with an acidic medium, with pronounced antiseptic properties, against a number of pathogenic and opportunistic microorganisms. Local application of vaginal swabs and douches with mineral water anolyte in patients with bacterial vaginosis leads to the disappearance of complaints, reduction of microscopic shifts in vaginal smears, normalization of the pH of the environment, which has a positive effect on the reproductive health of women.

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**Keywords:** bacterial vaginosis, anolyte, mineral water, medicinal herb, biocomposite

Treatment of bacterial vaginosis with classical medical methods does not always give the expected result. This is due to the diversity of etiological factors and pathogenetic mechanisms [3]. It is known that many pathogens have lost sensitivity to antibiotics and other antimicrobial drugs [7]. Increasingly, chronic BV is treated with combined treatment, including the local use of non-medicinal products, mineral waters, therapeutic muds and other natural medicines.

In recent years, methods have been developed to increase the effectiveness of the intravaginal action of drugs at the expense of auxiliaries that enhance the absorption of water- and fat-soluble components [8–10]. Phytopreparations and biocomposites used in traditional medical schools of India [4], Iran [1], Brazil [6], have been randomized comparative clinical trials and have proven their effectiveness is not less than in the standard treatment of BV with clotrimazole and chlorhexidine. utic factors.

Kyrgyzstan has a wide variety and rich reserves of medicinal plants and other medicinal resources (mineral water, mud, salt, clay, mummy, bee and animal origin products), which have been used since ancient times to treat inflammatory diseases.

We have not met modern works on the use of electroactivated mineral waters and other natural healing resources of Kyrgyzstan for the treatment of gynecological diseases, which served as the basis for the purpose of the study.

The aim of the work is to scientifically substantiate the possibility of using biocomposites from natural medicinal resources of Kyrgyzstan and electroactivated mineral water

for the treatment of inflammatory diseases of the genitourinary sphere in women.

### Materials and research methods

The work was carried out in several stages in *in vitro* experiments on bacterial strains and in the clinic on 45 women of reproductive age with bacterial vaginosis aged 19 to 38 years, average age  $28.7 \pm 2.4$  years. By random sampling, the surveyed were divided into 3 representative groups. Electroactivated water (anolyte) from well No. 854 of Cholpon-Ata thermal mineral water Deposit was used for the treatment of 15 women of the main group A in the form of daily douches with a course of 10 procedures. All women received informed consent for treatment with mineral water anolyte. For the treatment of 15 women of the main group B, vaginal tampons with a developed floral-salt composition were used, prescribed for the night No. 10. During this period, patients of the main groups A and B did not receive antibiotics. 15 women of the comparison group received conventional treatment with antibiotics. The study was carried out on the 2nd and 14th day of stay in the sanatorium.

Gynecological status was studied on the basis of examination of the external genitals, examination of the vagina and cervix with the help of mirrors. During the visual examination in women with ectopia of the cervix, the material was taken with sterile Volkmann spoons from the posterior vault of the vagina and the cervical canal. For microbiological cytological examination of the collected scrape prepared smears on slides.

Laboratory methods included:

1. Determination of pH and redox potential (RP) of mineral water, and flower-salt infusion, mucus of the cervical canal on the ionometer.

2-3. Determination of the concentration of potassium and sodium ions on a flame photometer according to GOST standard 23268.6-78 and GOST standard 23268.7-78.

4. Determination of chloride ions according to GOST standard 23268.17-78.

5. Determination of residual chlorine concentration according to GOST standard 18190-72.

6. Antibacterial properties of anolyte were determined on the test culture of *Escherichia coli* and *Staphylococcus aureus* by the standard method (Guidelines for sanitary and bacteriological studies and unification of methods of experimental study of various substances on microorganisms in water. Moscow. – 1981). The same cultures in concentrations of 1 million microbial bodies were used to determine the time of active bactericidal activity of the anolyte.

7. The qualitative assessment of the vaginal microflora included the characteristic of the majority of bacteria morphotypes encountered: gram-positive cocci, bacteroids, lactomorphotype, *Gardnerella* morphotype when stained with Papanicolaou. Previous PCR and ELISA results, if available, were also used.

The results were processed using computer programs of variational statistics for parametric and nonparametric indicators.

### Research results and discussion

When developing floristic-salt composition for vaginal tampons, we proceeded from the fact that the total properties of medicinal plants in biocomposites are mutually en-

hanced. Used plants that have anti-inflammatory, regenerative, hemostatic and antioxidant effects, based on the properties described in modern manuals on pharmacology and herbal medicine. An important point is the use of local medicinal raw materials, which in Kyrgyzstan is characterized by ecological purity and great diversity.

The composition of the collection includes: *Kalanchoe* leaves, *Hypericum*, *Marigold*, *Juniper* fruits, *Sea Buckthorn* fruits, *Sage*, *Chamomile*, *Nettle*, *Melissa*, *Mint*, *Thyme*, *Calendula*. To give greater osmolarity, we used natural medicinal salt *Chon-Tuz*, and greater acidity-citric acid. The formulation of the developed floral-salt composition is filed for patenting. When hot water is added, the infusion has a hypertonic concentration, an acidic medium (pH 4.2) and a high redox potential of 600 units.

Table 1 shows the physical and chemical properties of lake Issyk-Kul water and mineral water of the blue Issyk-Kul sanatorium (Well No. 854). The initial data correspond to long-term observations. After electroactivation, the water of lake Issyk-Kul changed its properties and composition: it became chloride-hypochloride calcium-sodium with a moderately acidic environment, the redox potential (RP) increased significantly to +640 units.

Even greater changes occurred with the mineral water of the sanatorium “Blue Issyk-Kul”, it also became chloride-hypochloride calcium-sodium, but the concentration of residual chlorine exceeded 50 mg/l, acidic medium-pH 2.9, with a very high ATS + 1060 units, i.e. it became a strong oxidizer. The total mineralization was not significantly changed.

Table 2 presents the results of the study of bacteriostatic action of the studied agents at different concentrations of microbial bodies.

**Table 1**  
Physical and chemical characteristics of Issyk-Kul lake water and well No. 854 before and after electroactivation

Characteristic	water of Issyk-Kul lake		mineral water sanatorium “Blue Issyk-Kul”	
	Initial index	Anolyte	Initial index	Anolyte
pH	7,2	4,0 *	8,2	2,9 *
RP	-80 units	+640 units*	-140 units.;	+1060 units *
general mineralization	5,8 g/l	5,6 g/l	14,3 g/l	14,1 g/l
concentration of active chlorine	0	30 mg/l *	0	> 50 mg/l *

Note: \* – criterion of reliability of differences with the initial level  $p < 0,05$ .

From the table it can be seen that the developed means have an antibacterial effect against the culture of *E. coli* and *Staphylococcus aureus*. Anolyte of Issyk-Kul lake water suppresses microbial growth at a concentration of 400 thousand microbial bodies per ml. anolyte of mineral water and flower-salt decoction suppresses microbial growth at a concentration of 400 million microbial bodies per ml.

Next, we checked the necessary time for the manifestation of the bactericidal effect of mineral water of the sanatorium "Blue Issyk-Kul" with the same cultures of microorganisms taken in an amount of 1 million / ml, in which it has a bactericidal effect (table 3).

The table shows that the mineral water anolyte has a high speed in relation to the sup-

pression of the studied strains of bacteria, leading to the suppression of growth after 1 minute of contact. The strength of the antimicrobial effect of the anolyte with the above parameters can be compared with the effect of using an anolyte 5% solution of table salt or 0.5% solution of chlorhexidine [2, 5]. This indicates the prospects of its application in sanitation and clinic.

At the next stage of research the microbiological characteristics of vaginal smears and physico-chemical properties of the cervical canal secretion in normal and bacterial vaginosis are given. For sanatorium treatment in the sanatorium "Blue Issyk-Kul" women were sent in the non-acute phase of the disease. However, pathogenic and opportunistic bacterial flora was detected in 58% of observations (table 4).

**Table 2**

Effect of anolyte of mineral water of the sanatorium "Blue Issyk-Kul" and lake Issyk-Kul, as well as infusion for tampons on *E. coli* and *Staphylococcus aureus*

Microorganisms' strains	Number of microbial bodies in 1 ml	Lake anolyte	Anolyte MV	Infusion for tampons'
<i>Escherichia coli</i>	2,5 billion.	growth	growth	growth
	400 mln.	growth	no growth	no growth
	400 thousand.	p/H	no growth	no growth
<i>Staphylococcus aureus</i>	2,5 billion.	growth	growth	growth
	400 mln.	growth	no growth	no growth
	400 thousand.	no growth	no growth	no growth

**Table 3**

Bactericidal effect of anolyte of mineral water of sanatorium "Blue Issyk-Kul" and necessary time of its action for manifestation of bactericidal influence

Bacterias' strains	Contact time		
	15 min	5 min	1 min
<i>Escherichia coli</i>	No growth	No growth	No growth
<i>Staphylococcus aureus</i>	No growth	No growth	No growth

**Table 4**

Vaginal microflora in women with bacterial vaginosis

microflora	Number of patients
I Specific pathogens	
Trichomonas	5
Chlamydias	2
Gardnerella	3
Candida	5
II Non-specific and conditionally pathogenic flora	11
III negative results	19
Total	45

**Table 5**

Microscopic indicators in women with bacterial vaginosis before and after treatment (number of cases)

Indicator	1 <sup>st</sup> group (anolyte)		2nd group (phytotherapy)		3rd group (antibiotics)	
	before	After	Before	after	before	after
“Key” cells in large numbers	5	0,5*	5	1,5*	5	4
White blood cells in moderate and significant amounts	8	1*	9	3*	9	5
Absence or sharp reduction of lactobacilli	6	2*	7	2*	7	4 *
Number of microbes (more than 100 in sight)	5	0*	6	2*	5	2 *

Note: \* – criterion of reliability of differences with the initial level  $p < 0,05$ .

**Table 6**

Physical and chemical parameters of cervical mucus in the experimental and control group before and after treatment

Indicator	1 <sup>st</sup> group (anolyte)		2nd group (phytotherapy)		3rd group (antibiotics)	
	Before	After	Before	After	Before	After
pH	$7,6 \pm 0,3$	$5,6 \pm 0,2^*$	$7,5 \pm 0,3$	$6,2 \pm 0,2^*$	$7,4 \pm 0,3$	$6,8 \pm 0,3$
RP	$+77 \pm 36$	$+380 \pm 26^*$	$+102 \pm 31$	$+325 \pm 22^*$	$+79 \pm 34$	$+130 \pm 25$

Note: \* – criterion of reliability of differences with the initial level  $p < 0,05$ .

As can be seen from the table, about a third of the women had specific flora or had previously had specific STIs. In 24.4% of cases, nonspecific or conditionally pathogenic flora was detected. In 19 patients, the tests were negative, which, in our opinion, is due to the previously conducted antibacterial therapy at the pre-sanatorium stage.

Bacterial vaginosis was also confirmed microscopically (table 5).

This was evidenced by the presence of “key” cells up to 30% of observations, leukocytes in a moderate and significant amount up to 60% of observations, the absence or sudden decrease in lactobacilli in 50-80% of the surveyed. A large number of microbes (more than 100 in sight) was observed in the initial smears in 30% of the surveyed.

A comparative characteristic of the action of the proposed drugs and classical antibiotic treatment is given in table 6.

Anolyte led to the normalization of all physical and chemical parameters of cervical mucus. Treatment of bacterial vaginosis with phytotampons also resulted in a significant increase in initially reduced ORP, as well as a moderate increase in initially increased pH. At the same time, in the comparison group of treatment with antibiotics alone, the trends towards normalization were unreliable.

Microscopic examination of vaginal smears confirms that the greatest positive changes were noted in the treatment of bacterial vaginosis with mineral water anolyte, and smaller-with antibiotics, in the treatment of phytotampons microscopic indicators occupied an average position (see table. 5).

### Conclusion

1. Developed on the basis of natural medicinal resources of Kyrgyzstan flower-salt composition, including dried leaves of Kalanchoe, Hypericum, Marigold, Juniper fruits, dried Sea Buckthorn fruits, Sage, Chamomile, Nettle, Melissa, Mint, Thyme, Calendula, Citric acid, salt Chon-Tuz has antibacterial, anti-inflammatory, anti-allergic and regenerative effect.

2. Electrochemical activation of the mineral water of Cholpon-Ata Deposit and the water of Issyk-Kul lake allows to obtain anolyte with an acidic medium, rich in free chlorine, with pronounced antiseptic properties, against a number of pathogenic and opportunistic microorganisms.

3. Local application of vaginal swabs and douches with mineral water anolyte in patients with bacterial vaginosis leads to the disappearance of complaints, reduction of microscopic shifts in vaginal smears, normalization of the pH, which has a positive effect on the reproductive health of women.

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