To The Results of Experimental Mycological Studies of Activated Silica Water in Relation to Strains of C. Albicans.

[1]Mavlyanova Shakhnoza Zakirovna, [2]Mavlyanov Pulat Narimanovich, [3]Mullakhanov Javlon Bakhtiyarovich

[1]Doctor of Medical Sciences, Professor, Head of the Scientific Laboratory of the Republican Specialized Scientific and Practical Medical Center for Dermatovenerology and Cosmetology, Ministry of Health of the Republic of Uzbekistan, *e-mail:* shahnoza_m@mail.ru

[2]Basic doctoral student, geologist, National University named after M. Ulugbek, *e-mail:* pulat@yandex.ru

[3]DSc, Head of the Consultative Polyclinic of the Republican Specialized Scientific and Practical Medical Center for Dermatove nereology and Cosmetology of the Ministry of Health of the Republic of Uzbekistan *e-mail:* docjavlon@gmail.com

Abstract

The article presents experimental miclogical studies of the determination of the antimicotic efficacy of activated silicon water. The experimental mycological studies to determine the antimycotic properties of activated siliceous waters showed that disks impregnated with activated siliceous waters with SiO_2 content at a dose of 48.2 mg/l increase the sensitivity of C. albicans to antimycotics by 1.4 times, and at a SiO_2 concentration of 20 mg/l - 1.2 times, respectively. The results obtained are of great importance in the development of effective methods of antimycotic therapy.

Recently, the geological services have been actively discussing the development of a new direction in geology, called medical geology. [2,10]. In the Republic of Uzbekistan, this has already originated in the use of natural waters for medicinal purposes. [2] When solving practical problems, the main emphasis is on natural mineral waters (questions of studying their distribution and medicinal properties, calculating reserves, etc.).

The global market is characterized by a tendency to consume drugs of natural origin used for the prevention and treatment of diseases of various etiologies. This is an aqueous solution of silicon water. [1, 4,7]

Mineral waters containing silicic acid have long attracted the attention of balneologists. They are used in the treatment of skin diseases, traumatic injuries, diseases of the gastrointestinal tract (with the content of silicic acid, mainly in undissociated, colloidal form, in particular in skin diseases). Silicon waters are also used for metabolic disorders in the body, diseases of the biliary tract, organs of support and movement, and the nervous system.

For example, Tashkent mineral water, containing silicic acid up to 40 mg/l or more, having a bacteriostatic and bactericidal effect on conditionally pathogenic microorganisms, is widely used for balneotherapy in the treatment of a number of diseases in the health resorts of Tashkent and the Tashkent region. [2]

Silicic acid in an amount of more than 50 mg/l is typical for most nitrogenous thermal waters with a temperature of more than 35° C. Its content in groundwater usually depends on temperature and pressure. Scientific research of recent years has shown that the intensive exploitation of underground mineral waters, along with a negative impact (a decrease in pressure affects the decrease in total reserves), also has a certain positive effect on the change in the chemical composition of mineral waters.[2,4,7]

In medical practice, the determination of the sensitivity of microorganisms - the causative agents of human infectious diseases to antibacterial drugs (ABP) - is becoming increasingly important due to the emergence and widespread antibiotic resistance in bacteria. Studies have shown that the resistance of microorganisms to antibiotics can be natural and acquired [3,5]. Natural resistance is a constant species feature of microorganisms [3]. True natural resistance is characterized by the absence of an antibiotic target in microorganisms or the inaccessibility of the target due to initially low permeability or enzymatic inactivation [1].

The aim of the study was to study the antimycotic activity of silica water against clinical strains of C.albicans.

Material and research methods. The experimental study was carried out on 15 strains of C.albicans isolated from patients with skin diseases in the bacteriological laboratory of the RSSPMCDVNandC of the Ministry of Health of the Republic of Uzbekistan. The antimycotic activity of activated siliceous water provided by SE GIDROYENGEO was studied. The disk-diffusion method was used to study the antimycotic activity of activated siliceous waters. Were used sterilized activated siliceous water containing silicon oxide - in a dose of SiO_2 - 20 mg/l and 48.2 mg/l.

Keywords*:* silicon oxide, silicon water, antimitotic sensitivity, C. albicans.

Mycological studies included microscopy of biosubstrates (oral mucosa, feces, skin scales) and cultural studies. For cultural studies, Sabouraud medium was used, on which pathological material was sown. The crops were incubated in a thermostat at +37°C for 48-72 hours. Then, the amount of yeast flora was recorded (Karaev Z.O. et al., 1984).

The antimycotic activity of activated siliceous waters was determined by the Carby-Bauer method by diffusion of filter paper discs impregnated with preparations into solid nutrient media. Determination of the sensitivity of fungi to the antimycotic effect of samples with siliceous water was carried out on chromogenic agar. ("Himedia", India) in 24 hours.

Determination of the antimycotic activity of siliceous waters in relation to the culture of C.albicans was carried out according to the following method. On a plate with chromogenic agar 5 mm thick, a culture of C. albicans was sown with a loop, then disks soaked in silicon water with a SiO_2 concentration of 20 mg/l and 48.2 mg/l diffused into the agar. As a comparison, discs impregnated with antimycotic preparations voriconazole 1 μg, fluconazole 25 μg, amphotericin -100 U, nystatin 100 U, itraconazole -10 μg, ketoconazole -10 μg, clotrimazole - 10 μg were placed on chromogenic agar with the same culture of microorganisms. To study the antimycotic activity, Petri dishes with media were placed in a thermostat at a temperature of 37° C. After 24 hours, the zones of inhibition of growth of microorganisms were measured in millimeters. In the absence of a growth zone with a diameter of ≥5 mm, high sensitivity was considered, with a diameter of up to 5 ml, sensitive and 0, insensitive.

The results of the study were statistically processed using standard methods of variation statistics using the Student's t-test using the Excel-Office-2003 application program on a Pentium IV computer.

Results of the study: In order to study the antimycotic sensitivity of activated siliceous waters, mycological experiments were divided into 3 groups: I - group - control group - standard sensitivity determination using standard antimycotic discs. II - group of experimental studies - the use of disks impregnated with activated siliceous waters containing silicon oxide SiO2 at a dose of 20 mg/l and 48.2 mg/l. III - group - standard discs impregnated with silica solutions containing SiO2 at a dose of 20 mg/l and 48.2 mg/l. The results of experimental studies are presented in

Table 1.

Comparative characteristics of indicators of increased sensitivity of the microorganism C.albicans to antimycotics impregnated in activated silica water SiO2. (absence of a growth zone with a diameter of ≥5mm, (n=15) (abs)

antimycotics	I - group	II- group	III - group
	antimi- cat discs	antimycotic + activated silica water SiO_2 48,2 mg	antimycotic + activated silica water SiO_2 20 mg
nystatin 100U	11	14	13
fluconazole 25mcg/disk	13	15	14
ketaconazole 10 mcg/disk	7	9	8
clotrimazole 10 mcg/disk	5	8	5
amphotericin 100U	6	9	7
variconazole 1 mcg/disk	9	12	12
itraconazole 10 mcg/disk	8	11	11

As follows from the table, the results of the disk-diffusion method for determining the antimycotic sensitivity of the C.albicans fungus with standard disks showed that the largest number of fungal strains - 13 out of 15 were highly sensitive - to fluconazole 25 μg / disk, which amounted to 86.6%, nystatin 100U - 78.6% (11 out of 15), then variconazole 1 μg/disk - 60% (9 strains), itraconazole 10 μg/disk - 53.3% (8 out of 15), amphotericin 100 U - 40% (6 out of 15) and clotrimazole 10mcg/disk - 5 strains, which amounted to 33.3%.

Whereas, in group II, where standard antimycotic discs were impregnated with siliceous solutions containing SiO_2 48.2 mg, the index of hypersensitivity to fluconazole was noted in 15 (100%) strains, which was 1.4 times increased compared to the indicators with standard disks. High sensitivity to nystatin - in 14 (93.3%), variconazole - in 12 (80%), itraconazole - in 11 (73.3%), to amphotericin and ketaconazole - in 9 (60%) and clotrimazole - in 8 (53.3%) respectively.

And in group III, where standard antimycotic disks were impregnated with 20 mg siliceous solutions, the number of C.albicans strains with high sensitivity to fluconazole was 14 (93.3%), to nystatin - 13 (86.6%), variconazole - 12 (80 %), itraconazole - 11 (73.3%), amphotericin - 7 (46.6%), ketaconazole - 8 ((53.3%) and clotrimazole - 5 (33.3%), respectively.

We were interested in experimentally investigating the sensitivity of C. albicans to disks without antimycotics impregnated with activated siliceous waters containing 48.2 mg and 20 mg SiO2, respectively. (table 2).

Table 2.
Sensitivity indices of micromycete C. albicans to siliceous solutions with SiO_2 content of 48.2 mg and 20 mg, taking into account the growth zone.

c.albicans n=15	≥5 mm	up to 5 ml	0
discs SiO_2 48,2 mg	3	4	8
discs SiO_2 20 mg	-	2	13

• Diameters - ≥5mm - considered high sensitivity, with a diameter of up to 5 ml - sensitive and 0 - not sensitive.

As can be seen from the table, studies of the sensitivity of the micromycete C. albicans to siliceous solutions with a SiO_2 content of 48.2 mg showed growth suppression in the zone of more than 5 mm - in 3 strains, which amounted to 20% (3 out of 15), less than 5 mm - in 4 strains (26.6%), while to discs with a SiO_2 content of 20 mg - in 2 strains, medium sensitivity was noted, which corresponded to growth suppression of less than 5 mm and amounted to 13.3% of cases.

The obtained results of the study indicate that activated siliceous waters containing SiO_2 at a dose of 48.2 mg help to suppress the growth of C. albicans culture in 20% of cases. In our opinion, this ability of activated silicon water can be explained by geological and chemical laws and features of the chemical composition of rare earth elements (REE) in natural and activated condensed silicon water.

Conclusions:

Thus, experimental mycological studies to determine the antimycotic properties of activated siliceous waters showed that disks impregnated with activated siliceous waters containing SiO_2 at a dose of 48.2 mg/l increase the sensitivity of C. albicans to antimycotics by 1.4 times, and at a SiO_2 concentration of 20 mg/l - 1.2 times, respectively. The results obtained are of great importance in the development of effective methods of antimycotic therapy.

Literature:

1. Akuginova Z.D., Suslikov V.L., Kuyukinova G.E. Silicon and tuberculosis // Study and use of siliceous rocks of Chuvashia: Cheboksary. 1998. S. 76 - 94.
2. Bakiyev S.A., Ibragimov A.S. Conditions for the formation of siliceous mineral waters in the Pritashkent region. //Abstracts of the International Scientific and Technical Conference. Tashkent, 2014, pp. 376-378.
3. Bukharin O.V. Persistence of bacterial pathogens as a physiological phenomenon. // Bulletin of Moscow University. - Ser.16. Biology - 2008. No. 1. -With. 6-13.
4. Voronkov M.G., Kuznetsov I.G. Silicon in nature. Novosibirsk: Nauka; 1984.
5. Mavlyanova Sh.Z., Boymirzaev N.I., Ismagilov A.I. To antibacterial sensitivity of staphylococcus spp. isolated from skin lesions in patients with allergic dermatosis. // Dermatovenereology and aesthetic medicine. Scientific and practical journal - No. 2/2017 (34) - p. 38
6. Mironov A.N., Sakaev I.V., Sakayan E.I., Korsun L.V., Mochikina O.A. Modern

approaches to the issue of standardization of medicinal plant raw materials. Bulletin of the Scientific Center for Expertise of Medicinal Products. - 2003. - No. 2. - C. 52-56.

7. Olodovsky P.P., Belko N.T., Poznyakov V.K., Istomin Yu.P., Karpel O.V., The role of flint water in accelerating the removal of radioactive isotopes from biological tissues. resources "2001. - №2 .- P.121.

8. Determination of the sensitivity of microorganisms to antibacterial drugs. //Semina N.A., Sidorenko S.V., Razvan S.P., Grudinina S.A. etc. Methodical instructions. MUK 4.2.1890-04. – Clinical microbiology. - 2004 - Volume 6. - No. 4 - p. 306 - 346.

9. Padeyskaya E.N. Some aspects of the history of antimicrobial therapy. // Clinical microbiology. - 2010, Volume 12, No. 4 - p.353-360.

10. Rikhvanov L.P. Ecological and geochemical research as a basis for the formation and development of medical geology at the National Research Tomsk Polytechnic University. // Exploration and protection of mineral resources. No. 1/2018. With. 25-32
1278-1288.

11. Sidorenko S.V., Kolbin A.S., Balkina Yu.E. Socio-economic aspects of acquired bacterial resistance. // Clinical pharmacology and therapy. – 2010 -№5- p.16-22.

12. Skripnikova I.A., Guriev A.V. Micronutrients in the prevention of osteoporosis: focus on silicon. // Osteoporosis and osteopathy. -2014 -No. 2.-S.38-40.

13. Shkarin V.V., Kovalishena O.V., Blagonravova A.S. A method for determining the sensitivity of bacteria to disinfectants when monitoring resistance to antimicrobial drugs in medical organizations. // Federal clinical guidelines. – 2015 – 233p.

14. Seleem M. N. Silica-Antibiotic hybrid nanoparticles for targeting intracellular pathogens // Antimicrobial agents and chemotherapy. - 2009. - P. 4270-4274.

15. Slowing I.I. Mesoporous silica nanoparticles as controlled release drug delivery and gene transfection carriers // Adv. drug. Deliv. Rev. - 2008. - Vol. 60. - P.