Annals of R.S.C.B., ISSN: 1583-6258, Vol. 25, Issue 1, 2021, Pages. 6431 – 6439
Received 15 December 2020; Accepted 05 January 2021.

Improvement of the Method of Plasmosorption in Liver Insufficiency on the Background of Mechanical Jaundice and Estimation of its Efficiency in Experiment

Sadiykov R.A[1], Khakimov D.M[2], Kasimov N.A[3], Nosirov M.M[4]
Republican Specialized Scientific and Practical Medical Center for Surgery named after AcademicianV.VakhidovaAndijan State Medical Institute

ABSTRACT

To enhance the sorption effect during extracorporeal detoxification in order to correct hepatic failure against the background of obstructive jaundice, a method of plasma sorption based on the use of a new domestic carbon nanoporoushemosorbent in combination with laser irradiation of blood plasma is proposed. High detoxification activity was noted during 2 sessions of plasma sorbent both with a carbon sorbent (a decrease in total bilirubin from 213.8 ± 8.0 to 100.5 ± 6.1 μmol / l), and when using domestic carbon hemosorbent (from 217.3 ± 6.6 to 90.3 ± 5.4 μmol / L), which significantly ($p < 0.05$) differed from the control without plasmasorption, a similar picture was obtained for the parameters of urea, creatinine and ammonia, the values of which were normalized much faster ($p < 0.05$) after the first session of extracorporeal detoxification.

THE URGENCY OF THE PROBLEM.

At present, the maintenance of liver function in liver failure is of particular relevance and remains one of the promising areas in hepatology. A recently published prospective randomized controlled trial by F.S. Larsen et al. (2019) demonstrated that "therapeutic plasma exchange" not only improved the hemodynamic and biochemical parameters of blood in patients with hepatic failure, but also the overall hospital survival by 10% [1]. J. Damsgaard et al. in 2019 published the world's first case of successful treatment of Wilson's disease using plasmapheresis and penicillamine, as an intermediate measure, which led to an improvement in the patient's condition without the need for liver transplantation [2]. In the case of acute and hyperacute liver failure, some clinics use continuous hemodialysis, which, according to the authors, “effectively dialyses ammonia molecules, but the removal efficiency directly depends on the dialysate flow and the filter surface” [3]. Various case series and studies have shown that sorption treatments are safe for patients with hepatic impairment and can significantly reduce both ammonia concentration and the degree of hepatic encephalopathy. Plasma sorption combines two main therapeutic principles in one intervention: replacement of excretory and metabolic functions of the liver and removal of harmful circulating toxins and cytokines [4]. Plasma clotting, which is often severely impaired, is also improved by plasma adsorption without any volume overload [4]. The unresolved problems of extracorporeal detoxification include the compatibility of adsorbents with blood and the specificity of the elimination effect. Most unmodified sorbents are "aggressive" with respect to blood corpuscles and "blind" with respect to adsorbents. Several ways of solving these problems have been identified. So, one of them is the creation of coatings of sorbent granules or the widespread use of perfusion, in which the contact of blood cells with adsorbents is completely or partially excluded. The aim of this study was to evaluate the improved method of plasma sorption in liver failure against the background of obstructive jaundice in the experiment.

MATERIALS AND METHODS OF EXPERIMENTAL RESEARCH.

The object of research was an experimental assessment of the safety and efficiency of plasmasorption (PS) using a new domestic granular carbon hemosorbent (UNPGS) with a predominant content of nano- and mesopores on the model of obstructive jaundice (MF). This stage of preclinical analysis will allow further research in the clinical phase of the trial. The sorbent developers are the employees of Uzkimyosanoat JSC, Tashkent Scientific Research Institute of Chemical Technology LLC and State Institution RSNPMTSH named after Akad V. Vakhidov "(Ortikov N.T., Karimov M.U., Jalilov A.T., Sadykov R.A.," Method of obtaining a carbon sorbent // Universum: Chemistry and biology: electronic scientific journal, 2020, No. 11 (75) In vivo studies The objective of these studies was to evaluate the effectiveness of PS using UNPGS in an experimental model of breast cancer in dogs.A total of 16 studies were carried out in mongrel dogs in conditions of modeling of breast cancer and liver failure.
Physicochemical characteristics of the finished product "UNPGS": hydrophobic granules up to 0.5 mm in size, insoluble in solvents. pH 6-7. Appearance: black granules. The color of the solution containing the sorbent is transparent. Ash content - 3%.Iodine number - 120. Pore sizes - meso- and nanopores. Impurity content (%) - ≤ 0.001.Mass fraction of carbon (%) - not less than 99.5.Mass fraction of total sulfur (%) - no more than 0.3.Bulk density (kg / m3) - 600-750. Active ingredients: carbon sorbent with nano- and mesopores. The physicochemical characteristics of the sorbent were studied using standard techniques adopted in analytical chemistry, as well as physicochemical studies in accordance with GOST.
Experimental studies were carried out on 16 mongrel dogs. The animals were kept in a vivarium in accordance with the requirements of GOST ISO 10993-11-2011 on the proper conditions for the preparation and observation of experimental animals. To determine the parameters of acute and chronic toxicity, the methods and criteria of ISSN 2011 were used.

RESULTS AND DISCUSSION.

The adsorption of UNPGS from aqueous solutions of standard dyes with different molecular weights was studied: methylene blue, murexide, neutral red, and Congo red. The concentration of substances in the solution, initial and after contact with the sorbent, was measured on a spectrophotometer in a cuvette 10 mm thick at a wavelength of 640 (methylene blue), 546 nm (neutral red), and 580 nm (murexide, Congo red).
A step-by-step determination of the concentration of the dye in the solution (every 10 min) showed that the degree of adsorption by the sorbent is more related to the size of the molecules, that is, dyes with a high molecular weight were absorbed through the pores of the sorbent less than dyes with a lower weight. So, the concentration of Murexid in the supernatant fluid 10 minutes after interaction with the carbon hemosorbent already reached 58.2 + 0.4%, after 30 minutes - 76.3 + 0.6% and 40 minutes - 84.2 + 0.5% , that is, about 16% of the dye remained unadsorbed in the solution (Table 1).

Annals of R.S.C.B., ISSN: 1583-6258, Vol. 25, Issue 1, 2021, Pages. 6431 – 6439
Received 15 December 2020; Accepted 05 January 2021.

Table 1
Dynamics of the absorption coefficient of dyes with different molecular weights in the study of the adsorption properties of carbon hemosorbent (%)

Dye	Initially	10 minutes	20 minutes	30 minutes	40 minutes
Murexid	0	58,2+0,4	66,3+0,1	76,3+0,6	84,2+0,5
t-test	-	-101,83	-18,04	-15,31	-12,90
P	-	<0,001	<0,001	<0,001	<0,001
Methylene blue	0	46,2+0,4	50,8+0,2	72,8+0,3	74,5+0,4
t-test	-	-80,83	-9,39	-41,45	-2,97
P	-	<0,001	<0,001	<0,001	<0,001
Neutral red	0	71,6+0,2	76,8+0,6	87,1+0,4	91,2+0,4
t-test	-	-146,15	-7,96	-18,02	-7,17
P	-	<0,001	<0,001	<0,001	<0,001
Congo red	0	24,9+0,1	32,5+0,7	36,4+0,7	41,0+0,3
t-test	-	-55,45	-10,95	-5,62	-8,67
P	-	<0,001	<0,001	<0,001	<0,001

Note: t-test is reduced to previous value

In this case, all the final concentration indicators (for 40 min) significantly differed (P <0.001) from each other, from the minimum absorption - Congo red dye (41.0 + 0.3%) to the maximum absorption - Neutral red dye (91, 2 + 0.4%).
Accordingly, if the degree of concentration of Murexide in the initial solution was 100%, then after 10 min it decreased to 41.8%, and after 40 min it was only 15.8% (Fig. 1).

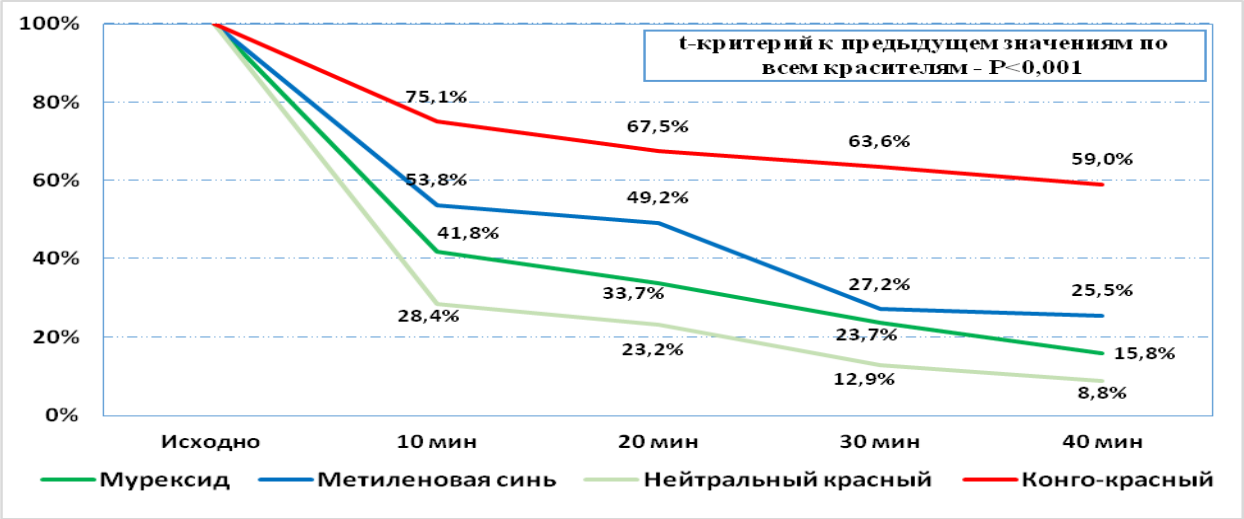

Fig. 1. Dynamics of the decrease in the concentration of the studied dyes with different molecular weight (%) during incubation with carbon hemosorbent

Annals of R.S.C.B., ISSN: 1583-6258, Vol. 25, Issue 1, 2021, Pages. 6431 – 6439
Received 15 December 2020; Accepted 05 January 2021.

The test results confirmed the biological compatibility and bioeffectiveness of the developed domestic hemosorbent UNPGS in accordance with the existing requirements for medicines. The meso- and nanoporous structure of the sorbent characterizes its high activity in relation to pathological blood metabolites in liver and kidney diseases.

RESULTS OF EX VIVO PRECLINICAL STUDIES.

The sorption activity of the sorbents was tested first on model solutions and then on plasma. On model solutions, 10 ml of a buffer solution (pH-7.4) was used as the sorbed liquid, which contained: bilirubin-200.0 μmol / L, urea - 50.0 μmol / L, ammonia - 150.0 μmol / L, lactate - 25.0 μmol / L, creatinine - 150.0 μmol / L.
The degree of decrease in the endcentration of the studied metabolites after incubation with a sorbent for 30 minutes in a thermal shaker was evaluated.
As a result of the research, it was found that during the incubation of 10 ml of the test solution with the UNPGS sorbent in an amount of 200 mg, the concentration of the studied metabolites decreases: bilirubin by 5 times, urea by 4 times, ammonia by 3.7 times, lactate by 1.5 times and creatinine by 4, 5 times (Table 2)

Table 2
Change in the concentration of metabolites in the test solution as a result of the sorption of UNPGS

Metabolite	Initial concentration	Final concentration	P
Bilirubin	200,0+ 1,2	43,5+2,8	<0,001
Urea	50,0+0,8	12,5+2,3	<0,001
Ammonia	150,0+1,9	40,5+2,8	<0,001
Lactate	25,0+0,6	16,7+0,4	<0,001
Creatinine	150,0+1,3	33,3+3,1	<0,001

Thus, the data obtained indicate that the carbon hemosorbent is characterized by the necessary complex of properties and meets the requirements for materials intended for interaction with biological media, is hemocompatible, has a good sorption capacity and high kinetic parameters for a number of metabolites for various types of endogenous intoxication.
Interesting results were obtained on the study of the concentration of total protein and protein fractions of blood serum, which revealed that after the sorption of UNGPS there is an insignificant decrease in total protein by 4.2%, while there is no change in the ratio of albumin and globulin fractions (Table 3).

Annals of R.S.C.B., ISSN: 1583-6258, Vol. 25, Issue 1, 2021, Pages. 6431 – 6439
Received 15 December 2020; Accepted 05 January 2021.

Table 3
Change in the concentration of protein fractions during the sorption of UNPGS

Protein	Before GS	After HS	t (p)
Total protein (g / L)	7,2+0,2	6,9+0,3	1,47 (>0,05)
Albumin (%)	59,6+2,5	56,2+3,1	1,39 (>0,05)
Globulin (%)	41,4+1,9	43,8+2,3	1,07 (>0,05)

Thus, it was determined that one of the positive properties of UNPGS, along with the high sorption effect of bile pigments, is an insignificant effect on the sorption activity in relation to the total protein index and the ratio of its fractions (albumin and globulin), according to the values of which no significant differences were obtained before and after HS.

PRECLINICAL EVALUATION OF THE EFFECTIVENESS OF UNPGS IN IN VIVO EXPERIMENTS.

The studies were carried out on the model of breast cancer in mongrel dogs. The experimental model consisted in the formation of obstruction of the common bile duct. In our studies, at this stage of the experiment, the formation of mammary glands was performed in 12 animals, the maximum clinical picture of the pathological process manifested itself on the 5th day after the operation. Since that time, the experimental animals were divided into 3 groups of 4 animals:
Control group No. 1 - animals that did not undergo treatment in the form of extracorporeal detoxification after the restoration of the bile passage (on the 5th day).
Control group No. 2 - animals for which, on the 5th day after the formation of the pathological process and restoration of the bile passage, plasma sorption (2 sessions) was carried out using a carbon sorbent based on anion exchange resin - AN-221 (manufactured by OOO "Himimpex", Ukraine).
Experimental group - animals, which on the 5th day after the formation of the pathological process and restoration of the passage of bile underwent 2 sessions of extracorporeal detoxification with domestic hemosorbent.
The main objective of the experiment was to assess the sorption efficiency of the domestic hemosorbent in comparison with another agent, while initially we did not pursue the goal of improving the sorption properties, since the first domestic carbon sorbent was studied, which, first of all, should not be inferior to foreign analogs in the given properties.
The control point for determining the effectiveness of plasmasorption with a new domestic hemosorbent was 5 days after the beginning of the formation of the experimental model of breast. In both groups, the balloon of the Fogarty catheter was deflated and the latter removed. The dynamics of the decrease in the main biochemical parameters of blood in experimental animals was assessed. Animals that underwent PS with various sorbents underwent 2 detoxification sessions, 1 session per day with repeated sampling of plasma in one session up to 3 times.
The technique was as follows. The femoral vein was cannulated. Was taken 200 ml of blood from a vein, followed by replacement of 150 ml of saline. Blood was collected in a sterile sodium citrate container. The resulting blood was centrifuged at 3000 rpm for 15 minutes. Blood plasma was taken for the procedure, the erythrocyte mass returned to the bed. Blood plasma was connected to the UNIROL apparatus and passed through the UNPGS hemosorbent. In the amount of 100g in a container. In the recirculation mode at a pressure of

100 cm of water column sorption was carried out at room temperature for 20 minutes. Subsequently, the plasma returned to the channel. The plasma sorption procedure was carried out with repeated sampling of plasma up to 3 times in order to maximize the concentration of metabolites in the blood of the animal. There were no complications.

Interesting data were obtained from the dynamic assessment of biochemical parameters. So, if initially after modeling the breast on the 5th day the level of total bilirubin did not differ in the comparison groups, then further 2 sessions of PS made it possible to more significantly reduce this indicator. In the control without PS, the total bilirubin in two days decreased from 216.0 ± 13.2 to 146.0 ± 10.5 μmol / L, while during PS with a carbon sorbent (control No. 2) these values changed from 213.8 ± 8.0 to 100.5 ± 6.1 μmol / L, which significantly ($p < 0.05$) differed from control No. 1. The use of domestic carbon hemosorbent led to a decrease in the level of bilirubin after 2 sessions of PS from 217.3 ± 6.6 to 90.3 ± 5.4 μmol / L, which also significantly ($p < 0.05$) differed from control No. 1, but at the same time, in relation to the coal sorbent, an insignificant difference was obtained ($p > 0.05$).

The urea level in the control without PS for two days decreased from 11.8 ± 0.9 to 10.3 ± 0.6 mmol / L, while when PS was carried out with a carbon sorbent (control No. 2) these values changed from 11.5 ± 1.2 to 8.3 ± 0.5 mmol / L, which significantly ($p < 0.05$) differed from control No. 1. The use of domestic carbon hemosorbent led to a decrease in the level of urea after 2 sessions of PS from 11.0 ± 1.1 to 8.3 ± 0.3 mmol / L, which also significantly ($p < 0.05$) differed from control No. 1, but at the same time, in relation to the coal sorbent, an insignificant difference was obtained ($p > 0.05$).

In the control without PS, creatinine in two days decreased from 154.8 ± 15.1 to 134.5 ± 8.6 μmol / L, while during PS with a carbon sorbent (control No. 2) these values changed from 151.8 ± 7.7 to 104.5 ± 3.9 μmol / L, which significantly ($p < 0.05$) differed from control No. 1. The use of domestic carbon hemosorbent led to a decrease in the level of creatinine after 2 sessions of PS from 151.3 ± 10.3 to 107.8 ± 7.1 μmol / L, which also significantly ($p < 0.05$) differed from control No. 1, but at the same time, in relation to the coal sorbent, an insignificant difference was obtained ($p > 0.05$).

In the control without PS, ammonia in two days decreased from 61.0 ± 1.5 to 51.3 ± 2.0 μmol / L, while during PS with a carbon sorbent (control No. 2) these values changed from 59.3 ± 1.7 to 45.5 ± 1.2 μmol / L, which significantly ($p < 0.05$) differed from control No. 1. The use of domestic carbon hemosorbent led to a decrease in the level of creatinine after 2 sessions of PS from 60.3 ± 2.3 to 44.0 ± 1.5 μmol / L, which also significantly ($p < 0.05$) differed from control No. 1, but at the same time, in relation to the coal sorbent, an insignificant difference was obtained ($p > 0.05$).

As for the total protein index, the PS with a coal sorbent led to a significant decrease due to the sorption sedimentation of protein fractions in the pores of the sorbent. If in the control without PS the blood protein indicator changed insignificantly for two days - from 69.0 ± 1.3 to 62.8 ± 1.0 μmol / L, then when PS was carried out with a carbon sorbent (control No. 2) these values changed from 68.5 ± 1.3 to 55.8 ± 1.1 μmol / L, which significantly ($p < 0.05$) differed from control No. 1.

The use of domestic carbon hemosorbent due to a given pore size did not lead to a significant decrease in the level of total protein in the blood, and after 2 sessions of PS this indicator changed from 67.3 ± 2.3 to 60.5 ± 0.9 μmol / L, which is reliable ($p > 0.05$) did not differ from control No. 1, but with respect to the coal sorbent, a significant difference was obtained ($p < 0.05$).

Thus, the greatest effect was observed after 2 sessions of plasma sorption with a total (stepwise) use of 400 ml of plasma. A significant decrease in the level of almost all pathological levels of metabolites was achieved: bilirubin, urea, creatinine, ammonia. Whereas the protein level in the experimental group remained without significant changes.

Each PS session was accompanied by the use of a new sorption column. For UNPGS PS was most effective within 10 minutes (in a ratio of 50 g / 100 ml of plasma).
The results obtained, which testify to the high sorption activity of the domestic hemosorbent, have shown virtually identical efficiency in comparison with the coal sorbent. In this connection, the next task of this study was to assess the possibility of enhancing the sorption activity of hemosorbent. For this, it was decided to use the effect of laser radiation on the pores of the hemosorbent. This method is carried out as follows: when the plasma is passed through the carbon hemosorbent, the pathological metabolites are adsorbed by the sorbent granules. For better absorption of metabolites by the pores of the sorbent, pulsed IR laser radiation in the range of 890-950nm is used. Laser radiation is carried out in a pulsed mode, with parameters not less than 7 W per pulse, with a frequency of 80-100 Hz. Laser irradiation begins 10 minutes after the beginning of sorption and continues for another 20 minutes. In total, a plasmasorption session using one sorbent lasts 30 minutes. The use of a laser should help to increase the sorption capacity of the sorbent due to the effect of a shock light wave at the interface between the media: liquid-sorbent granules. IR radiation in this range has the maximum penetrating ability in biological media of the body. The use of the 80 Hz frequency is justified by the optimal biological effect in this frequency range of radiation.
A domestic certified Sogdiana laser apparatus was used. Radiation in the range of 890nm, frequency mode from 80Hz to 1500Hz. Pulse power up to 10W.
To assess the effectiveness of the proposed method of plasmasorption with the addition of laser irradiation, experimental studies were carried out on 4 mongrel dogs. The model of breast formation was consistent with the previously described technique. The results of this part of the experiment were compared with the data obtained when using plasmasorption with domestic hemosorbent without connecting laser irradiation (LR).
Initially, after modeling the breast on day 5, the level of total bilirubin did not differ in the comparison groups. Subsequently, carrying out 2 sessions of PS with hemosorbent without LN showed a change in total bilirubin from 217.3 ± 6.6 to 90.3 ± 5.4 μmol / L, while the combination of PS with LN made it possible to reduce these indicators from 216.5 ± 11 , 0 to 63.8 ± 6.4 μmol / L, which was significantly ($p < 0.05$) different. For other metabolites, no significant differences were obtained during these periods, however, there was still a tendency for their more rapid decrease.

CONCLUSION.

The results of studying the properties of UNPGS on a model of obstructive jaundice showed no harm and biological effectiveness of nanomesoporous carbon hemosorbent, and also confirmed its biological compatibility in accordance with the existing requirements for medicines. The meso- and nanoporous structure of the sorbent characterizes its high activity in relation to pathological blood metabolites in liver and kidney diseases.
The data obtained indicate that the carbon hemosorbent is characterized by the necessary complex of properties and meets the requirements for materials intended for interaction with biological media, is hemocompatible, has a good sorption capacity and high kinetic parameters for a number of metabolites with various types of endogenous intoxication.
It was determined that one of the positive properties of UNPGS, along with a high sorption effect of bile pigments, is an insignificant effect on the sorption activity in relation to the total protein index and the ratio of its fractions (albumin and globulin), according to the values of which no significant differences were obtained before and after GS.
The results obtained with substantiated safety and efficiency of PS through a new domestic hemosorbent with the inclusion of laser irradiation in the detoxification process make it possible to recommend the use of the developed technique in clinical practice, with a further

assessment of the quality of extracorporeal detoxification in the complex treatment of liver failure against the background of obstructive jaundice or other etiology in the clinical phase. research.

REFERENCES:

[1] Larsen FS, Schmidt LE, Bernsmeier C et al. High-volume plasma exchange in patients with acute liver failure: an open randomized controlled trial. J Hepatol. 2016; 64 (1): 69-78.
[2] Damsgaard J, Larsen FS, Ytting H. Reversal of acute liver failure Due to wilson disease by a regimen of high-volume plasma exchange and Penicillamin. Hepatology. 2019; 69: 1835-1837.
[3] Busch M, Wedemeyer HH. Acute liver failure-The importance of rapid diagnostics and early initiation of treatment. Internist (Berl). 2020; 61 (11): 1151-1162.
[4] Larsen FS, Schmidt LE, Bernsmeier C et al. High-volume plasma exchange in patients with acute liver failure: an open randomized controlled trial. J Hepatol. 2016; 64 (1): 69-78.
[5] Schwartz J, Padmanabhan A, Aqui N, et al. Guidelines on the use of therapeutic apheresis in clinical practice-evidence-based approach from the writing Committee of the American Society for Apheresis: the seventh special issue. J ClinApher. 2016; 31: 149-162.
[6] Bekchanov D; Kawakita H; Mukhamediev M; Khushvaktov S; Juraev M. Sorption of cobalt (II) and chromium (III) ions to nitrogen- and sulfur-containing polyampholyte on the basis of polyvinylchloride /Polymers for Advanced Technologies 2021 https://doi.org/10.1002/pat.5209
[7] Davron, B., Mukhtar, M., Nurbek, K., Suyun, X., Murod, J. Synthesis of a New Granulated Polyampholyte and its Sorption Properties. *International Journal of Technology*. Volume 11(4), pp. 794-803. ., (2020) https://doi.org/10.14716/ijtech.v11i4.4024
[8] Mukhamediev, M.G., Bekchanov, D.Z. New Anion Exchanger Based on Polyvinyl Chloride and Its Application in Industrial Water Treatment. Russ J ApplChem 92, 1499–1505 (2019). https://doi.org/10.1134/S1070427219110053
[9] Mukhamediev, M.G., Auelbekov, S.A., Sharipova, Z.T. et al. Polymer complexes of gossypol and their antiviral activity. Pharm Chem J 20, 276–278 (1986). https://doi.org/10.1007/BF00758817
[10] Ikramova, M.E., Mukhamediev, M.G., Musaev, U.N. Complexation of hydrazine- and phenylhydrazine-modified nitron fibers with iodine/ Plasticheskie Massy: SintezSvojstvaPererabotkaPrimenenie, (12), стр. 41–45 (2004)
[11] Gafurova, D.A., Khakimzhanov, B.S., Mukhamediev, M.G., Musaev, U.N. Sorption of Cr(VI) on the anion-exchange fibrous material based on nitron. Russian Journal of Applied Chemistry, 75(1), стр. 71–74, (2002)
[12] Rustamov, M.K., Gafurova, D.A., Karimov, M.M. et al. Application of ion-exchange materials with high specific surface area for solving environmental problems. Russ J Gen Chem 84, 2545–2551 (2014). https://doi.org/10.1134/S1070363214130106
[13] Bazarova D. Some problems of counteracting crimes related to laundering of illegal proceeds in Uzbekistan Journal of Advanced Research in Dynamical and Control Systems. Volume 11, Issue 7, 2019, Pages 873-885
[14] Ismailova, Z., Choriev, R., Ibragimova, G., Abdurakhmanova, S., &Abdiev, N. (2020). Competent model of Practice-oriented education of students of the construction profile. Journal of Critical Reviews. Innovare Academics Sciences Pvt. Ltd. https://doi.org/10.31838/jcr.07.04.85

[15] Ismailova, Z., Choriev, R., Musurmanova, A., &Aripjanova, M. (2020). Methods of training of teachers of university on advanced training courses. Journal of Critical Reviews. Innovare Academics Sciences Pvt. Ltd. https://doi.org/10.31838/jcr.07.05.85
[16] Ismailova, Z., Choriev, R., Salomova, R., &Jumanazarova, Z. (2020). Use of economic and geographical methods of agricultural development. Journal of Critical Reviews. Innovare Academics Sciences Pvt. Ltd. https://doi.org/10.31838/jcr.07.05.84
[17] Isakov, A., Tukhtamishev, B., &Choriev, R. (2020). Method for calculating and evaluating the total energy capacity of cotton fiber. IOP Conference Series: Earth and Environmental Science, 614(1), 012006
[18] Davirov, A., Tursunov, O., Kodirov, D., Baratov, D., &Tursunov, A. (2020). Criteria for the existence of established modes of power systems. IOP Conference Series: Earth and Environmental Science, 2020, 614(1), 012039
[19] Obidov, B., Choriev, R., Vokhidov, O., &Rajabov, M. (2020). Experimental studies of horizontal flow effects in the presence of cavitation on erosion-free dampers. IOP Conference Series: Materials Science and Engineering, 883(1), 012051
[20] Khasanov, B., Choriev, R., Vatin, N., &Mirzaev, T. (2020). The extraction of the water-air phase through a single filtration hole. IOP Conference Series: Materials Science and Engineering, 2020, 883(1), 012206
[21] Shokhrud F. Fayziev The problem of social stigma during a pandemic caused by COVID-19 International Journal of Advanced Science and Technology Vol. 29, No. 7, (2020), pp. 660-664 http://sersc.org/journals/index.php/IJAST/article/view/13965/7188
[22] FayziyevShokhrudFarmonovich Medical law and features of legal relations arising in the provision of medical services. International journal of pharmaceutical research Volume 11, Issue 3, July - Sept, 2019 P. 1197-1200 doi:10.31838/ijpr/2019.11.03.088 http://www.ijpronline.com/ViewArticleDetail.aspx?ID=11016
[23] Bryanskaya Elena, FayzievShokhrud, Altunina Anna, MatiukhaAlena Topical Issues of an Expert Report in the Process of Proving in a Criminal Examination. International Journal of Engineering and Advanced Technology (IJEAT) ISSN: 2249 – 8958, Volume-9 Issue-1, October 2019 5345-5349 DOI: 10.35940/ijeat.A2946.109119
[24] https://www.ijeat.org/wp-content/uploads/papers/v9i1/A2946109119.pdf
[25] FayzievShokhrud (2019) Legal Aspects of Transplantology in the Republic of Uzbekistan. Systematic Reviews in Pharmacy, ISSN: 0976-2779, Vol: 10, Issue: 2, Page: 44-47 doi:10.5530/srp.2019.2.08
[26] http://www.sysrevpharm.org//fulltext/196-1575419211.pdf?1586863081
[27] Tulaganova, G.Some issues of observance of international legal norms of fight against legalization of criminal incomes in the Republic of UzbekistanJournal of Advanced Research in Dynamical and Control Systems 12(2 Special Issue), c. 143-155