# MICROELEMENTS METABOLISM IN CHILDREN WITH UROLITHIASIS

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## Abstract

In the present article results of research of 150 children at age range from 3 till 14 years with urolithic illness with the complicated infections urethral canals are stated.

Two basic variants of a clinical course before and after operative removal concrements from urethral canals are analyzed with traditional and complex metabolites-dietary methods of treatment which last one is developed by authors.

On the basis of the organized clinical-laboratory researches the conclusion is drawn that not only imbalance of microcells is at the heart of disorders of exchange processes. The inefficiency or high relapse of disease after the performed traditional therapy before operation is a consequence of insufficiency of the complex approach of correction not only macroergic components, but also in cellular exchange process at the given illness.

The method of therapy offered by authors before operation results corrections of exchange process in an organism as a whole. At the heart of a method application is the so-called the tick connections of microcells which concern natural complex producers of amino acids, vitamins.

**Keywords:** Elements in norm and urolithiasis at children, tick connections of microelements, natural complexes of amino acids, vitamins.

## Introduction

The structure and functional activity of biological membranes, as you know, are closely interrelated with the state of metabolic processes in general and with the metabolism of lipids, essential trace elements (Fe, I, Cu, Zn, Co, Cr, Mo, Se, Mn), which are necessary for the normal functioning of the body. ... They are part of enzymes, vitamins, hormones and other biological active substances [5].

Trace elements are involved in the construction of hormones, enzymes, proteins and other highly active compounds, take part in the regulation of metabolic processes in the body, enhance bioenergetic processes, increase antibody production and detoxification properties of various systems, affect the immunobiological reactivity of the body [5,17].

It has been proven that microelements play an important role in the life of the body. Their deficiency or excess in the body can cause not only physiological changes, but also endemic diseases [11,15].

Researchers have observed profound disturbances in the metabolism of trace elements in children with urolithiasis [1,21,23]. So in sick children with urolithiasis in the blood plasma, a decrease in the concentration of copper, manganese, bromine, antimony and cobalt was observed. In parallel with pathological shifts in the levels of iron, zinc, bromine, cobalt, copper, in the blood plasma, the content of albumin in the blood serum decreases and the content of alpha - gamma - globulins and potassium in the blood serum increases, as well as the level of creatinine in the blood plasma. The degree of elevation of zinc, rubidium and bromine in urine depended on the number of kidney stones [1]. Protein components, essential trace elements, vitamins and coenzymes play an important role in the functioning of membrane structures [1].

The polyethological nature of urolithiasis and the abundance of factors of causal genesis (prerenal, renal and postrenal) lead to relatively homogeneous physicochemical disturbances of the colloidal crystalloid balance of urine and stone formation.

Stone formation depends on a number of physical and chemical processes, the body as a whole and in the urinary system in particular. Supersaturation of stone-forming substances in the blood, urine entails the formation of crystals of salts and microlites, which are a favorable condition for the formation of stones. The precipitation of salts in the urine is prevented by citrates, hippuric acid, magnesium, ions of zinc, manganese, cobalt, as well as the concentration of hydrogen ions, which is 5.6-6.0 in the urine. The addition of a urinary infection significantly increases the frequency of relapses and worsens the course of the disease [3,23].

Trace elements in the serum of sick children with urolithiasis complicated by obstructive pyelonephritis in the acute stage, there is an imbalance in the content of trace elements in the serum, in the form of accumulation of iron and selenium and a deficiency of copper, zinc, cobalt and manganese, which indicates the depth of the pathological process [22].

The concentration of zinc and copper in the blood serum in patients with chronic renal failure positively correlates with the daily excretion of zinc and copper in the urine [14].

Due to the violation of the imbalance of microelements within the cell, an energy deficit occurs, leading to a violation of metabolic processes, followed by calcium overload of the epithelial cells of the tubules. In turn, this leads to impaired reabsorption of both calcium and other substances in the kidneys. Potassium and magnesium come from the epithelial cell of the tubules into the interstitial space, and then into the lumen of the peritubular capillary along the concentration gradient, mainly passively [8].

With hypercalciuria, hyperphosphaturia and hyperparathyroidism, the addition of urinary tract infections can cause stone formation. In particular, hypercalciuria was accompanied by an alkaline shift in urine pH. Violation of urine acidification is one of the important risk factors for stone formation. As you know, a sharp change in the acidification of urine in the acidic side, creates a threat of the formation of uric acid, and in the alkaline side - phosphate lithiasis [25].

The lack of manganese in the diet causes an increase in the concentration of calcium and phosphorus in the blood serum, reduces the content of hemoglobin and leukocytes. There is a synergy between magnesium and vitamin B6, between selenium and tocopherol, retinol acetate and ascorbic acid promote better absorption of iron, chromium is easily metabolized with ascorbic acid [5].

In case of impaired calcium metabolism, recurrent calcium oxalate stones may appear, with the oxalate form of urolithiasis, the formation of recurrent phosphate stones is possible when a urinary urease-producing infection is combined [7, 10].

Excessive simultaneous consumption of protein, sodium chloride, citric acid in combination with calcium-containing foods contributes to hypercalcemia and hypercalciuria. The processes of formation of calcium ultrafiltrate depend on the quantity and quality of incoming bile acids and the nature of the food. A decrease in the amount of bile acids in the small intestine inhibits the formation of ultrafiltrate and calcium absorption, and vitamin D metabolites enhance the absorption of calcium in the intestine and increase its excretion by the kidneys [6].

Thus, the violation of the metabolism of trace elements in the body is one of the causal factors in the formation of stones in the urinary tract. Currently, a number of studies have appeared that give reason to assert that, by promoting or opposing the inclusion of microelements in the tissues of the body in certain biochemical cycles, it is possible to direct the course of certain biochemical processes in the body along the desired path. The control of the exchange of trace elements contained in the tissues of the body is possible with the help of the so-called claw compounds, which include natural complexing agents, amino acids, vitamins, Krebs cycle acids and artificial complexing agents, etc.

It should be noted that trace elements in the form of dosage forms of cobalt, zinc sulfate, copper sulfate, together the use of coenzymes of vitamins of group B, an antioxidant of vitamins E, C, PP and protein preparations - albumin, synthetic mixtures of amino acids, led to an improvement in the metabolism of oxaloacetic and uric acids, inorganic phosphorus and calcium, trace elements and indicators of lipid peroxidation in children with urinary tract infections against the background of urolithiasis [2,4,12,16].

Biologically active food supplement containing zinc and ascorbic acid increased the content of IgM, C3 and C4 complement components in blood serum, and also increased the content of secretory IgA in saliva [25].

Mg L-asparaginate and Mg chloride in combination with pyridoxine under conditions of oxalate crystalluria caused by pyridoxine deficiency reduce crystal formation [18, 19].

After the administration of magnesium salts, there was a significant decrease in the urine Ca / Mg ratio in comparison with the control group, and the urine oxalate / creatinine ratio also decreased. The most pronounced effect on this indicator was exerted by magnesium L-asparaginate in combination with vitamin B6, magnesium salts significantly reduce the excretion of oxalates, the formation of calcium oxalate crystals, and increase the pH of urine. [6].

Based on the above data obtained, we set the task to study the content of some trace elements in plasma, erythrocytes, urine upon admission of sick children with complicated forms of urinary tract infections against the background of urolithiasis. To analyze the changes in dynamics against the background of traditional and developed therapy before and after the removal of saline calculi from the urinary tract.

## Material and methods

In the clinics of TashPMI, the content of trace elements of copper, iron, manganese was studied in 150 children from 3 years to 14 years old upon admission to the hospital. Separately, it was investigated in dynamics before and after removal of calculus from the urinary tract in 26 children who received traditional therapy in comparison with 29 children who received complex metabolic-dietary treatment (Patent No. 462 PV Uz dated 03.16.1994).

Determination of trace elements Fe, Cu, Mn, Co, Zn, Se. in erythrocytes, plasma and daily urine, we resorted to the neutron activation method developed in the neutron activation laboratory of the Institute of Nuclear Physics of the Academy of Sciences of the Republic of Uzbekistan by A.A. Kist et al. (1967).

This method is characterized by high accuracy, relatively low labor intensity, a wide range of research elements, the ability to automate processes. In addition, a minimal amount of material can be examined, and the sensitivity of activation analysis for most trace elements is much higher than conventional analytical methods.

All measurements were carried out on a 64 cm Ge (Li) detector with a resolution of 3.5 keV along the Co60 1330 keV line connected to an LP-4900 multichannel analyzer. For comparative analysis, reference blood samples of healthy children were taken, obtained by the Institute of Nuclear Physics by the method of Zhuk L.I. (1987).

In this regard, we studied the state of ME metabolism in serum, erythrocytes and their excretion with urine in 150 sick children with single and multiple kidney stones at the age from 3 to 14 years, the control group consisted of 50 children of the same age. There were 81 patients with single kidney stones, 69 patients with multiple stones. ME in serum, erythrocytes and urine was determined by neutron activation method [9].

Previous clinical and biochemical studies [20,24,26] revealed deviations in the content of bioelements (iron, copper, cobalt, zinc) and changes in protein-amino acid metabolism [10], the provision of the body with vitamins A, E, C, B1, B6 , immunological reactivity (26), established the pathogenetic relationship of these disorders with the frequency and nature of violations of membrane phospholipids [27]. Based on the results of clinical, biochemical, bacteriological, functional studies and the study of the salt composition of removed kidney stones, in the treatment of CP, we took into account the entire correction of urine gas, normalization of the main metabolic

pathways of the conversion of substances in the body, an increase in energy supply, the processes of lipid and protein synthesis.

So, for the normalization of energy metabolism, and as a plastic material for the cells of the tubules of the kidneys and other organs and systems, vitamin and non-vitamin coenzyme preparations, antioxidants, antiplatelet agents, biocomplex-microelements, synthetic amino acid mixtures, native plasma, albumin were used. Lipoic acid, calcium pantothenate, riboflavin mononucleotide, pyridoxal phosphate, nicotinamide, tocopherol acetate, trental, curantil, cupir, cobamamide, ferramide, zinc sulfate were also used for these purposes.

Predlozhennyy sposob lecheniya byl proveden [28] u 81 bol'nykh, iz nikh 46 – s odinochnymi, 35 – s mnozhestvennymi kamnyami pochek (osnovnaya gruppa, poluchavshaya metabolitnoye lecheniye). Gruppu sravneniya (kontrol'-bazisnoye lecheniye) sostavili 69 bol'nykh, iz nikh 35-s odinochnymi, 34-s mnozhestvennymi kamnyami pochek, s KP.

The proposed method of treatment was carried out [28] in 81 patients, of which 46 - with single, 35 - with multiple kidney stones (the main group receiving metabolite treatment). The comparison group (control-baseline treatment) consisted of 69 patients, 35 of them with single, 34 with multiple kidney stones, with KP.

## Result and discussion

Analysis of the dynamics of the ME content in erythrocytes in children with acute CP with single kidney stones during treatment is presented in Table 1. As can be seen from the data obtained, with the development of acute CP in children, there is a sharp iron deficiency (in comparison with the indicators of healthy children). cobalt, zinc, manganese, selenium, respectively. At the same time, a significant increase in copper is observed. Conducting intensive metabolic therapy (MT) for 18 days contributes to a noticeable increase in iron (compared to the data before treatment), manganese and a decrease in copper levels, at the same time, normalization of cobalt (compared to the data of the basic treatment), zinc and selenium is observed. Due to the effectiveness of MT, the response from the ME content in this group of children to surgery is not as pronounced as in children who received basic treatment (BT) before surgery. Carrying out further MT in the postoperative period allows to normalize the level of iron, copper, cobalt, manganese, selenium.

Thus, according to the data obtained, in children with acute CP after MT, the ME balance in erythrocytes normalizes. In contrast to the membranes of erythrocytes in the serum of this group

of patients, the ME content has its own specificity. So, upon admission to the clinic, in children with acute CP, the level of iron and selenium was markedly increased, with respect to other MEs, their deficiency in serum was noted. So copper, cobalt, zinc, manganese. After preoperative preparation, the ME level, especially in the group receiving MT, leveled off. At the same time, the level of iron and selenium returned to normal. After the operation, in the group receiving BT, the content of ME sharply decreases almost to the level of values on admission, and in the group receiving MT, such a decrease was not observed.

When analyzing the results obtained at discharge, it can be seen that in children who received MT in serum, normalization of iron, copper, cobalt, zinc is observed, i.e. By the time of discharge, ME metabolism is completely stabilized in children with acute CP. This indicates the effectiveness of MT in normalizing the ME balance.

**Table 1**

**Dynamics of the content of trace elements in erythrocytes, in serum and urinary excretion in acute calculous pyelonephritis with single kidney stones (a-basic, b-metabolite treatment) (X + m)**

| Study periods | Trace elements, μmol /l | | | | | |
|---|---|---|---|---|---|---|
| | iron | copper | Cobalt | zinc | manganese | selenium |
| n= a / b | 35/46 | 35/46 | 35/46 | 35/46 | 35/46 | 35/46 |
| In erythrocytes | | | | | | |
| Healthy children, n=50 | 18,29+0,52 | 14,46+0,31 | 0,49+0,002 | 34,96+1,09 | 1,72+0,012 | 0,76+0,014 |
| On admission a. | 9,17+0,30 | 21,83+0,75 | 0,112+0,006 | 22,63+1,14 | 0,423+0,009 | 0,423+0,009 |
| b. | 8,42+0,43 | 22,22+0,91 | 0,116+0,007 | 24,5+1,24 | 0,676+0,06 | 0,402+0,014 |

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|---|---|---|---|---|---|---|
| Day 18 a. | 11,42+0,29 | 18,47+0,67 | 0,201+0,009 | 27,17+0,96 | 1,373+0,011 | 0,580+0,009 |
| b. | 13,08+0,42 | 16,48+0,71 | 0,551+0,028 | 31,86+1,13 | 1,413+0,012 | 0,703+0,017 |
| 1-3 days after surgery a. | 8,13+0,20 | 22,87+0,46 | 0,085+0,007 | 19,17+0,67 | 1,235+0,021 | 0,483+0,010 |
| b. | 10,17+0,32 | 20,17+0,49 | 0,264+0,012 | 23,75+0,89 | 1,34+0,008 | 0,560+0,023 |
| 32nd day before discharge a. | 11,29+0,24 | 18,70+0,49 | 0,199+0,012 | 22,04+0,58 | 1,38+0,012 | 0,644+0,004 |
| b. | 16,58+0,45 | 16,22+0,50 | 0,450+0,025 | 29,75+0,55 | 1,79+0,017 | 0,83+0,021 |
| n=35/46 | In blood serum: | | | | | |
| Healthy children, n=50 | 53,0+1,39 | 45,24+0,88 | 0,244+0,004 | 24,0+0,51 | 3,10+0,06 | 0,508+0,013 |
| On admission a. | 85,0+1,39 | 22,0+0,69 | 0,032+0,001 | 15,0+0,39 | 0,713+0,013 | 0,600+0,002 |
| b. | 86,0+0,93 | 24,0+0,65 | 0,024+0,002 | 16,0+2,14 | 0,371+0,010 | 0,607+0,013 |
| Day 18 a. | 72,29+0,97 | 29,35+0,64 | 0,055+0,003 | 18,29+0,36 | 1,025+0,034 | 0,530+0,076 |
| b. | 50,63+3,25 | 38,43+0,75 | 0,105+0,009 | 22,0+0,47 | 1,730+0,015 | 0,458+0,013 |
| 1-3 days after | 80,0 | 18,52 | 0,03 | 11, | 0,8 | 0,6 |

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| surgery a. | +4,84 | +0,49 | 8+0,003 | 29+0,42 | 2+0,018 | 48+0,008 |
| b. | 63,0 +1,056 | 24,04 +0,59 | 0,06 5+0,004 | 17, 25+0,37 | 1,7 2+0,04 | 0,6 30+0,010 |
| 32nd day before discharge a. | 70,4 2+0,94 | 32,22 +0,59 | 0,08 9+0,020 | 15, 63+0,29 | 1,0 31+0,026 | 0,6 48+0,008 |
| b. | 51,3 8+0,69 | 43,39 +0,87 | 0,20 1+0,016 | 24, 0+0,40 | 2,7 4+0,032 | 0,5 50+0,006 |
| n=35/36 | Excretion in urine: | | | | | |
| Healthy children, n=50 | 34,2 9+1,08 | 1,86+ 0,031 | 0,08 0+0,004 | 4,8 6+0,33 | 0,3 94+0,007 | 0,1 53+0,005 |
| On admission a. | 97,3 8+3,0 | 4,71+ 0,098 | 0,21 7+0,011 | 18, 92+0,64 | 0,0 75+0,005 | 0,3 37+0,001 |
| b. | 104, 0+2,31 | 4,72+ 0,097 | 0,20 2+0,01 | 20, 0+0,65 | 0,0 79+0,001 | 0,3 31+0,013 |
| Day 18 a. | 74,2 9+2,0 | 3,25+ 0,061 | 0,13 7+0,009 | 14, 96+0,50 | 0,2 57+0,010 | 0,2 83+0,006 |
| b. | 50,3 3+1,43 | 1,92+ 0,071 | 0,11 7+0,007 | 12, 21+0,62 | 0,2 74+0,007 | 0,2 25+0,007 |
| 1-3 days after surgery a. | 86,0 +1,39 | 4,065 +0,05 | 0,20 5+0,010 | 22, 50+0,56 | 0,1 89+0,006 | 0,4 54+0,005 |
| b. | 59,0 +1,42 | 3,078 +0,05 | 0,21 0+0,013 | 16, 04+0,43 | 0,2 5+0,009 | 0,3 3+0,007 |
| 32nd day | 58,0 | 3,30+ | 0,18 | 14, | 0,2 | 0,3 |

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| before discharge a. | +0,81 | 0,07 | 8+0,009 | 0+0,44 | 60+0,006 | 19+0,011 |
| b. | 35,0 +1,21 | 1,71+ 0,04 | 0,08 5+0,005 | 9,0 8+0,33 | 0,3 7+0,004 | 0,1 5+0,006 |

**Table 2**

**Dynamics of the content of trace elements in erythrocytes, in serum and urinary excretion during exacerbation of CKD with bilateral (multiple) kidney stones (a-basic, b-metabolite treatment) (X + m)**

| Study periods | Trace elements, μmol / l | | | | | |
|---|---|---|---|---|---|---|
| | iron | copper | Cobalt | zinc | manganese | selenium |
| n=a/b | 34/35 | 34/35 | 34/35 | 34/35 | 34/35 | 34/35 |
| In erythrocytes | | | | | | |
| On admission a. | 6,61 +0,34 | 31,41 +0,59 | 0,068+0,0008 | 16,0+0,82 | 0,628+0,023 | 0,250+0,009 |
| b. | 7,16 +0,36 | 32,15 +0,72 | 0,065+0,008 | 15,48+0,82 | 0,679+0,055 | 0,251+0,011 |
| 16-18th day of treatment a. | 9,0+ 0,31 | 25,0+ 0,59 | 0,094+0,006 | 28,0+0,60 | 0,982+0,019 | 0,368+0,007 |
| b. | 12,13+0,40 | 18,0+ 0,75 | 0,120+0,002 | 23,0+0,60 | 1,418+0,012 | 0,553+0,10 |
| 1-3 days after surgery a. | 6,13 +0,25 | 31,0+ 0,61 | 0,064+0,002 | 16,0+0,62 | 0,762+0,017 | 0,248+0,009 |

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|---|---|---|---|---|---|---|
| b. | 9,38 +0,31 | 21,0+ 0,067 | 0,09 2+0,003 | 16, 0+0,62 | 1,2 52+0,001 2 | 0,7 02+0,012 |
| 32nd day before discharge a. | 9,0+ 0,22 | 24,0+ 0,40 | 0,13 9+0,0014 | 18, 0+0,59 | 1,6 1+0,015 | 0,7 02+0,012 |
| b. | 13,0 +0,29 | 16,15 +0,41 | 0,17 7+0,008 | 25, 0+0,59 | 1,6 0+0,015 | 0,7 67+0,007 |
| n=34/35 | In blood serum: | | | | | |
| On admission a. | 105, 0+1,74 | 16,0+ 0,81 | 0,01 0+0,007 | 13, 0+1,37 | 0,3 37+0,010 | 0,8 48+0,033 |
| b. | 103, 0+1,72 | 16,0+ 1,08 | 0,02 6+0,001 | 12, 84+1,32 | 0,3 71+0,008 | 0,8 67+0,029 |
| 16-18th day of treatment a. | 82,1 7+1,17 | 20,42 +1,04 | 0,04 3+0,00012 | 15, 16+026 | 0,9 68+0,022 | 0,6 74+0,026 |
| b. | 73,1 8+1,52 | 30,0+ 1,08 | 0,02 6+0,001 | 19, 12+0,76 | 1,7 34+0,015 | 0,5 47+0,20 |
| 1-3 days after surgery a. | 96,0 +0,77 | 14,44 +0,44 | 0,01 55+0,0012 | 13, 29+0,54 | 0,5 75+0,021 | 1,1 05+0,040 |
| b. | 85,4 2+1,12 | 23,17 +0,87 | 0,01 87+0,007 | 14, 62+0,52 | 0,8 85+0,013 | 0,7 89+0,017 |
| 32nd day before discharge a. | 81,7 8+1,08 | 30,41 +0,64 | 0,13 0+0,042 | 15, 49+0,54 | 0,6 82+0,018 | 0,8 28+0,029 |

| | | | | | | |
|---|---|---|---|---|---|---|
| b. | 66,3 3+1,07 | 41,0+ 1,03 | 0,13 8+0,001 | 21, 49+0,51 | 2,2 01+0,028 | 0,4 98+0,012 |
| n=34/35 | In urine: | | | | | |
| On admission a. | 111, 35+1,57 | 3,22+ 0,12 | 0,29 2+0,0015 | 27, 0+1,13 | 0,0 84+0,001 | 0,5 68+0,021 |
| b. | 112, 21+1,66 | 3,48+ 0,12 | 0,29 +0,009 | 26, 8+1,14 | 0,0 79+0,001 | 0,5 71+0,022 |
| 16-18th day of treatment a. | 94,2 6+1,07 | 2,51+ 0,09 | 0,19 7+0,0026 | 19, 0+0,65 | 0,1 71+0,005 | 0,4 26+0,018 |
| b. | 73,0 +1,49 | 1,91+ 0,06 | 0,17 3+0,006 | 14, 79+0,42 | 0,2 74+0,007 | 0,2 95+0,013 |
| 1-3 days after surgery a. | 100, 3+1,29 | 2,16+ 0,08 | 0,23 9+0,003 | 22, 56+0,59 | 0,1 71+0,005 | 0,5 88+0,017 |
| b. | 87,2 1+1,44 | 2,45+ 0,05 | 0,22 1+0,003 | 16, 14+0,42 | 0,1 51+0,014 | 0,1 51+0,003 |
| 32nd day before discharge a. | 84,7 4+0,80 | 1,78+ 0,06 | 0,18 9+0,006 | 14, 023+0,33 | 0,1 41+0,05 | 0,4 25+0,015 |
| b. | 60,2 1+5,21 | 1,67+ 0,03 | 0,12 9+0,007 | 9,0 13+0,21 | 0,3 27+0,007 | 0,1 93+0,007 |

To clarify the question of how the level of ME excretion with urine changes during the development of CP in children, we studied the dynamics of ME excretion with urine during treatment. As can be seen from Table 1, with the development of acute CP with single kidney stones in children, urinary excretion of all studied MEs sharply increases, with the exception of manganese, the level of which in urine drops sharply. It should be noted that manganese deficiency is observed in erythrocytes and in serum. Conducting intensive MT for 18 days contributed to a noticeable improvement in urinary excretion of ME, while normalization of the copper level should be noted. Analysis of the data after the operation shows that as a result of the operation, there is a sharp increase in the level of urinary excretion of almost all ME, especially in the group receiving BT. Consequently, MT makes it possible to stabilize the metabolism of ME to a certain extent by the time of surgery and thereby prevent a sharp deterioration in their metabolism, which occurs during BT. Further postoperative treatment, especially in the group receiving MT, leads to a complete normalization of the level of urinary excretion of iron, copper, cobalt, manganese and selenium.

Thus, MT is the best way to completely stabilize the level of ME in the body of children with acute CP with solitary stones, which in turn helps to improve the overall metabolism in the body of patients. In the case of the transition of an acute form of KP to a chronic form and with multiple kidney stones (MKK), the revealed ME imbalance increases, which indicates the depth of the pathological process. As can be seen from Table 2, in children with CKP in the acute stage with 2-sided multiple stones, there is a strong deficiency in erythrocytes of iron, cobalt and zinc, manganese and selenium. Unlike other MEs, the level of copper in erythrocytes rises sharply. Chronic ME deficiency in erythrocytes contributes to a decrease in the activity of a number of enzymes involved in cellular metabolism. In this regard, we studied the effect of MT on the state of ME in children with CKP in the acute stage. Conducting intensive MT allows to significantly increase the level of most ME in erythrocytes - iron, cobalt, zinc, manganese - by the 18th day. Thanks to MT, the response from ME to a stressful situation during surgery is not as pronounced as during BT. Further treatment allows stabilizing the level of copper, manganese, and selenium in the group receiving MT by the time of discharge. The rest of the ME, despite a significant increase in their content, still do not reach normal values. All this indicates that, despite the very good positive effect of MT, for a complete normalization of the ME composition in children with CKP in the acute stage with bilateral MCPs, longer treatment is required.

Analysis of the ME content in the serum of children with CKP in the acute stage shows that with the development of pathology, there is a sharp imbalance in the ME content. So, there is a sharp accumulation of iron and selenium in the serum, at the same time, there is a deficiency in the serum of copper, zinc, cobalt and manganese. In contrast to the acute form, the ME deficit in CKP is more pronounced, which indicates the depth of the pathological process. Conducting MT for 18 days leads to a certain increase in the serum ME levels, but despite the relative improvement in their values, they did not reach the control values. In this regard, after the operation, there is a sharp decrease in the content of ME, both in the group receiving basic treatment, and in the group receiving MT, which is the body's response to stress during surgery. Continuation of postoperative treatment, especially in the MT group, showed a noticeable increase in the level of copper, zinc, cobalt, manganese and a decrease in the level of iron. Of all ME in serum, selenium content is completely normalized after MT. Consequently, the presence of a pronounced effect in MT, in comparison with the baseline, does not completely eliminate the ME deficiency in the blood serum. To clarify the question of how much the renal systems involved in the excretion of ME in children with CKP in the acute stage are affected, we studied the dynamics of ME excretion in the urine during treatment.

As can be seen from the data obtained (Table 2), the development of CCP in children is accompanied by a sharp increase in the urinary excretion of iron, copper, cobalt, zinc, and selenium. Manganese excretion is sharply reduced. Consequently, the presence of a high level of urinary excretion of most ME contributes to the imbalance in the body of children. The use of MT for the correction of ME metabolism, already on the 18th day of treatment, leads to a significant decrease in urinary excretion of most ME, while normalization of the copper level is noted. Due to the fact that MT improves metabolism in comparison with BT, after surgery in the group receiving MT, the increase in urinary excretion is not as pronounced as in children receiving BT. Continuation of MT in the postoperative period contributes to a significant improvement in the metabolism of ME in children with CKP. So, according to the data at discharge after MT, the normalization of the level of copper and manganese in the urine is noted. In relation to other ME, there is a significant decrease in the level of excretion with urine: iron, cobalt, zinc, zinc and selenium, but despite the intensive MT, the above parameters do not reach normal values. Thus, metabolic - dietary therapy contributes to a more rapid normalization of trace elements. Consequently, the pathogenesis of CP in children is based on: a deficiency of vitamins and an

imbalance of trace element composition, which entails a whole cascade of metabolic disorders in carbohydrate, amino acid, and lipid metabolism.

## Conclusions

Violation of the metabolism of trace elements in the body is one of the causal factors, metabolic disorders of the cellular biocenosis and the formation of stones in the kidney and urinary tract.

By promoting or counteracting the inclusion of microelements in the tissues of the body in certain biochemical cycles, it is possible to direct the course of certain biochemical processes in the cell and the body as a whole along the desired path. Control of the exchange of trace elements contained in the tissues of the body is possible with the help of the so-called claw compounds, which include natural complexing agents, amino acids, vitamins.

Only complex metabolic - dietary therapy before and after removal of calculi from the urinary tract in children with urolithiasis reliably reduces the excretion, formation and crystallization of microliths in the urinary tract, increases urine pH.

## References

1. Beknazarov J. Impaired metabolism of some trace elements and their dynamics in the surgical treatment of children with urolithiasis // Abstract of the thesis for the degree of candidate of medical sciences. Leningrad, 1985. - 16 p.
2. Bryukhanov VM, Zverev Ya.F., Lamnatov VV, Zharikov A.Yu. Methodological approaches to the study of kidney function in an experiment on animals // Nephrology, 2009. Volume 13. №3. - S. 52-62.
3. Gres A.A., Voshula V.I., Rybina I.L., Shloma L.P. Urolithiasis: experience of application and effectiveness of rosifron // Scientific and practical dossier. Issue No. 1 2012. Tashkent - 0.2-1.
4. Dekhkanov K.A. The value of the body's provision with some vitamins and microelements in the pathogenesis and treatment of obstructive pyelonephritis in children // Abstract of the thesis for the degree of candidate of medical sciences. Almaty, 1994. - 26 p.
5. Dekhkanov K.A., Akhmedov Sh.M., Utegenov N.U., Shagiyazova L.M. Infectious factors against the background of obstructive uropathy causing the development of urolithiasis in children. Tibbiyotda Yangi Kun 3 (23) 2018. 25-30 s.
6. Kolpakov I.S. Urolithiasis disease. Moscow "ACADEMIA", 2006. -224 p.

**7.** Konstantinova O.V., Yanenko O.K. Predicting changes in the chemical form of urolithiasis // Urology, 2011.-№2 –S.19-23.

**8.** Krikun A.S. Kidney stone disease. Kiev, 2009.- 500 p.

**9.** Lagutina L.E., Utts I.A. //Pediatrics. - 1991. - No. 7.-P.96-100.

**10.** Levitsky D.O. Calcium and biological membranes. / M. Medicine, 1990.- 124 p.

**11.** Lopatkin N.A., Chudnovskaya M.V., Mazo E.B. and other Views on the etiology and conservative treatment of urolithiasis / In the book: Urolithiasis. Chelyabinsk, 1980.-P.6-8.

**12.** Makarova T.P., Maltsev SV., Agafanova E.V., Valiev B.C. Impaired zinc metabolism in various types of nephropathy in children // Pediatrics, 2005. - №4. - P.34-38.

**13.** Nurmukhamedov K.N., Utegenov N.U., Ionina M.G. The spectrum of amino acids and its correction in children with multiple kidney stones // Actual problems of nutrition and problems of alimentary-dependent diseases in the Republics of Central Asia and Kazakhstan / Materials of scientific and practical conference. Karshi, 1990-P.72-75.

**14.** Pavlov SB. Disorders of copper and zinc metabolism in patients with chronic pyelonephritis with the development of nephrosclerosis and renal failure // Urology and Nephrology, 1998. -№1.-P.7-9.

**15.** Pulatov A.T. Nephrolptiasis in children. - / M. Medicine, 1990.-241 p.

**16.** Rumyantseva S.A., Kravchuk L.D., Silina E.V. Antioxidants in the treatment of cerebrovascular diseases // Attending physician. 2006. - No. 5. - S. 39-43.

**17.** Skalny A.V., Kudrin L.V. Radiation, trace elements, antioxidants and immunity (trace elements and antioxidants in restoring the health of the liquidators of the Chernobyl accident). / M. Medicine, 2001.-422 p.

**18.** Spasov A.A., Iezhitsa I.N., Kharitonova M.B., Kravchenko M.C. Experimental substantiation of the effectiveness of magnesium salts in the correction of experimental calcium-phosphate nephrolithiasis // Nephrology, 2008. Vol. 12. - No. 2. - P.72-84.

**19.** Spasov A.A., Iezhitsa I.N., Kharitonova M.V., Kravchenko M.C. Influence of magnesium salts and their combinations with vitamin B6 on oxalate crystalluria arising in conditions of alimentary pyridoxine deficiency // Urology, 2009. - №23. - P.22-25.

**20.** Sulaimanov A.S., Utegenov N.U., Beknazarov Zh.B. et al. The state of protein-microelement metabolism in calculous pyelonephritis in children // Actual problems of

nutrition and problems of alimentary-dependent diseases in the Republics of Central Asia and Kazakhstan. Metr. Scientific and practical conference. - Karshi, 1990. -C.184-186.

**21.** Sulaimanov B.B. The provision of the body with vitamins B1, B6, microelements, amino acids of sick children with calculous pyelonephritis and methods of correction // Abstract of the thesis for the degree of candidate of medical sciences. Alma-Ata, 1990, 16 p.

**22.** Utegenov N.U. Influence of metabolic therapy on amino acid metabolism in children with calculous pyelonephritis // Bulletin of the KCO AN RUz, 1997. -№1, 2. -S.64-66.

**23.** Utegenov N.U. Clinical and pathological aspects of obstructive pyelonephritis in children: / Author's abstract. Dis.... Candidate of Sciences. L., 1980. - p.16.

**24.** Utegenov N.U., Akbarov A.B., Dekhanov K.A. and others. Dynamics of the content and methods of correction of irreplaceable trace elements (Fe, Cu, Co, Mn) in the blood and urine in calculous pyelonephritis in children // Human microelementosis: Mater. All-Union symposium. -M., 1989.-P.292- 293.

**25.** Utegenov N.U., Eshchanov A.T., Sultanov R.G. Metabolic correction of metabolic disorders in urolithiasis in children // Bulletin of the KCO AN RUz, 2000. - №1. - S. 21-28.

**26.** Utegenov N.U., Narcissov R.G., Kolesova O.A. and others. Immunoreactivity and supply of the body with zinc, vitamins A, E in calculous pyelonephritis in children // Actual problems of nutrition and problems of alimentary-dependent diseases in the Republics of Central Asia and Kazakhstan: Mater. Scientific-practical conference-Karshi, 1990.-P.72-75.

**27.** Utegenov N.U., Khasanov Yu.U., Dekhanov K.A. and others. Anti-recurrent metabolic correction and the organization of medical nutrition for urolithiasis in children: / Method.recommendations. - Tashkent, 1991. - P.49.

**28.** Utegenov N.U., Khuseinov M.U., Dekhanov K.A. Lipid metabolism and methods of its correction in acute purulent calculous pyelonephritis in children // Intra-national aspects of the problem “Ecology and health”, Materials of scientific-practical conference-Urgench, 1991.-P.279-281.

**29.** Sharafetdinov X.X., Sentsova T.B. Assessment of the immunomodulatory activity of combined preparations containing zinc and echinacea // Attending physician, 2012. - №2. - S. 104-106.