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MODERN INTERPRETATION OF KIDNEY FUNCTION IN THE EARLY NEONATAL PERIOD WITH CHRONIC PYELONEPHRITIS IN THE MOTHER

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Conclusion. *It is known that the formation of organs and systems of the fetus, the adaptive abilities of the child in the early neonatal period and the characteristics of its postnatal development are largely determined by the conditions of its intrauterine development [9,4] . Among full-term newborns born sick and sick in the first days of life, 50% of children are morphofunctionally immature [4] , which creates the basis for disintegration in newborns and the formation of pathology in the future [7,8,1] , i.e. has remote consequences. Thus, a third of children with intrauterine hypotrophy in the postnatal period lag behind in somatic and psychomotor development [9] ; most children suffered asphyxia and birth trauma of the central nervous system in the perinatal period. At the age of 3-6 years, kidney pathology is detected; every 5th child from mothers with gestosis has physical and psychomotor developmental disorders, and high morbidity in infancy.*
The basis of the disorders causing gestosis is the occurrence of generalized vascular spasm, which causes a disruption of the blood supply to tissues and organs. Vascular spasm causes an increase in arterial pressure, a decrease in the total volume of blood circulating in the vascular bed. These mechanisms of gestosis development lead to a disruption of the nutrition and normal functioning of cells and tissues. Damage to the inner lining of blood vessels - the endothelium - causes an increase in the permeability of the vascular wall and fluid exudation into the tissues, a change in the fluidity, viscosity and coagulability of the blood, a tendency to thrombosis in the vascular bed. The cells of the brain, kidneys, liver and placenta have the greatest sensitivity to insufficient blood supply and oxygen starvation.
Characteristic complications of gestosis are premature detachment of a normally located placenta, placental insufficiency leading to delayed development, hypoxia and fetal malnutrition .
Keywords: *Gestosis of pregnancy, newborns, lipid metabolism.*

Introduction. Pathological manifestations of maladaptation in the neonatal period often do not have signs of a local disease, but are of a polyorgan, polysystemic nature [8] . To date, respiratory, cardiovascular, endocrine, central nervous system , and gastrointestinal disorders have been studied in more detail. Meanwhile, it is known that critical conditions in newborns, regardless of the leading syndrome, are accompanied by a violation of the homeostatic function of the kidneys, and, above all, in relation to water-electrolyte balance [7] , since immediately after birth the kidneys become the main organ of homeostasis [15] .
The severity and outcomes of the disease in the peri- and neonatal period are also largely determined by the functional state of the kidneys [9,27] . Such conditions in pregnant women as pyelonephritis and combined gestosis lead to the formation of a morphotype with "general retardation of the body such as fetal growth retardation syndrome" (FGRS). Targeted studies are

needed taking into account the nature of extragenital pathology in the mother and scientifically based recommendations on rational adaptation regimens and principles of dispensary observation [13], since even against the background of general retardation in fetal development, intensive maturation of individual systems is possible [13] . A significant risk factor for the pathological course of pregnancy, childbirth and the birth of defective offspring is kidney pathology in the mother [4] . Thus, in a pregnant woman with kidney pathology, late toxicosis, changes in lipid metabolism, stimulation of lipid peroxidation (LPO) processes were revealed, which have an adverse effect on the structure and functions of the cell membranes of the fetus and newborn child [13,12] . A number of studies are devoted to the diagnosis of kidney diseases in pregnant women, their recovery, and labor management in women with kidney pathology. At the same time, the features of the homeostatic function of the kidneys in newborns from such mothers remain the least studied [11,4] . Pyelonephritis and nephropathy of pregnant women cause various and profound changes in the woman's body [15,5] . It has been established that such women have impaired homeostatic functions of the kidneys, stimulation of LPO, and a deficiency of antioxidants. In recent years, clinical membranology has been enriched with a series of studies on the role of LPO in encephalopathies, pneumonia, and in newborns.

However, targeted studies on the state of LPO in newborns from mothers with kidney pathology and their relationship with the functional state of the kidneys in newborns have not been conducted. Naturally, the features of the relationship between the morphological and functional maturation of the child in the mother with kidney pathology require special research, since even in healthy newborns, kidney activity is characterized by increased lability to the onset of functional failure.

The aim of this work is to study the characteristics of homeostatic functions of the kidneys, the state of lipid peroxidation in newborns from mothers with chronic pyelonephritis, with the subsequent development of methods for correcting their disorders.

Materials and research methods.

Design and object of the study

We observed 136 newborns. The control group consisted of 22 children of the same age, i.e. all newborns were born at 38-42 weeks of pregnancy. The body weight of full-term children averaged 3300±200.0, height 53±3.6 cm, weight -height ratio 63±3.0.

The above-mentioned newborns were born to mothers aged 20 to 30 years, who did not suffer from any chronic somatic pathology with a physiological course of pregnancy and childbirth (control group).

The main group consisted of 114 newborns who had the following symptoms: CNS depression syndrome was observed in 26.3% (30 children), agitation in 37 newborns (32.5%), tremor of the limbs and chin in 54 (47.4%), acrocyanosis in 43 (37.7%), and cyanosis of the nasolabial triangle in 77 (67.5%).

114 newborns were also born at term to mothers of the same age suffering from chronic pyelonephritis.

The assessment of the studied parameters was carried out depending on the presence and severity of gestosis of pregnancy.

Of the 114 women in the main group

In 30 (26.31%) cases, pregnancy proceeded relatively favorably, without visible signs of gestosis (group 1).

The remaining 84 mothers (73.7%) had pregnancies with OPG gestosis,

Of these, 17 women (20.2%) had manifestations of OPG gestosis throughout the pregnancy, and the disease duration was more than 10 years in 18 (21.4%), 5-10 years in 37 (44.1%), 1-5 years in 29 (34.5%) women. Of the total, 30 (26.3%) were diagnosed with pyelonephritis for the first time during this pregnancy, and 37-44% of pregnant women had exacerbations of the disease during pregnancy: 37 women at 20-24 weeks and 20 women at 30-34 weeks of pregnancy.

Of those observed, 12 (10.5%) were women over 30 years of age, 54 (47.4%) were women 25-30 years of age, and 48 (42.1%) were women 20-25 years of age. The average age was 25.7 ± 3.7 years.

Pre-gestational treatment and preparation for pregnancy were carried out in 23 (20.2%) of the 114 observed women.

All pregnant women were under observation of the corresponding territorial women's consultations. Taking into account the significant impact on the metabolism and functions of various organs and systems, newborns with signs of asphyxia during childbirth, symptoms of CNS damage, respiratory distress syndrome and intrauterine infection were combined into a special group (n=34).

Research. General clinical examination included careful consideration of the anamnesis of life and obstetric anamnesis, features of the course of pregnancy, childbirth, previous and concomitant diseases to pregnancy, childbirth, previous and concomitant diseases to pregnancy, general assessment of the state of diseases to pregnancy, general assessment of the child's condition according to the Apgar scale . Children from the comparison groups underwent a primary examination with an assessment of the clinical and somatic status according to generally accepted criteria.

Anthropometry of newborns was performed using standard measuring devices (desktop stadiometer and medical scales). Anthropometry of children included: determination of height, body weight .

Study of neurological status - instability of congenital reflexes, weakness or perversion of physiological motor reflexes in 70% of cases characterizing the early neonatal period [15] .

The assessment of the studied parameters was aimed at identifying clinical and paraclinical features, features of the development of the main functions of the kidneys in newborns born to mothers with OPG-gestosis, combined with chronic pyelonephritis.

Laboratory studies: The structural and functional state of cytomembranes , which are closely related to all renal functions, was assessed by the phospholipid spectrum of erythrocyte membranes, which was determined by TLC on silufol in a chloroform-methanol-water system (65:25:4) with subsequent development of the fraction by spraying with a 2% solution of phosphomolybdic acid and heating the plates to 100 ^{o} for 10 minutes. Identification of phospholipids was carried out by color reactions and standards. The following phospholipid fractions were determined: SFM, LPh, PEA, PC, FS. The intensity of lipid peroxidation processes was judged by the content of MDA in erythrocyte membranes according to the method of I.D. Stalnoy et al . Erythrocytes washed three times in physiological solution were used for the determination. Total phospholipase activity of blood was determined by the method of H. Brockerhoff R. Johnsen . The method is based on the fact that the erythrocyte membrane contains phospholipase A. The essence of the method is hydrolysis by endogenous phospholipases, mainly A $_2$ lecithin (PC). The accumulation of lysolecithin in the incubation medium causes toxic hemolysis of erythrocytes. Phospholipase activity of erythrocytes was determined in fresh blood.

The applied set of studies allowed us to obtain a reliable description of lipid metabolism, stability of erythrocyte membranes and functional state of the kidneys in the studied contingent of newborns.

Statistical research methods

for Windows software package (version 7, StatSoft , Inc.) and Excel 2016 for Windows. The methods of variation parametric and nonparametric statistics were used with the determination of the arithmetic mean (M), standard deviation (σ), standard error of the mean (m), and relative values (frequency, %). The statistical significance of the obtained measurements was determined by the Student criterion (t) with the calculation of the probability of error (P).

Research results and their discussion.

Results. In order to study the initial data on the state of lipid metabolism, stability of cell membranes and lipid peroxidation, we examined 22 healthy newborns from healthy mothers on the first and fifth days of life. (Table 1). As shown by the analysis of the lipid spectrum, healthy newborns had an increase in some lipid fractions by the 5th day of life. Thus, the level of total lipids (TL) at birth was 3.17 ± 0.33 g / l, and on the 5th day of life - 4.76 ± 0.5 g / l. A tendency to an increase in the content of FL, MDH was noted. However, the concentration of cholesterol had reliable differences and was 15.76 ± 1.13% in newborns on the first day, and 18.21 ± 1.03% on the 5th day. The TG content at birth was 11.56±1.45%, significantly increasing by the fifth day of life to 17.61±1.06%. The increase in the concentrations of OL, PL, TG, TC, and the decrease in ECS in healthy newborns by the end of the early neonatal period are apparently associated with the child's adaptation to extrauterine life, aimed at providing energy for its increased needs. The intensive increase in PL can be explained by the fact that all organs of the reticuloendothelial system that synthesize phospholipids are intensively involved in the process of PL biosynthesis.

The study of the phospholipid spectrum of erythrocyte membranes in healthy newborns showed an increase in the fraction of lysophosphatidylcholine (LPC), sphingomyelin (SM), phosphatidylethanolamine (PEA) by the end of the early neonatal period. The level of LPC increased by 81.6% and

amounted to 13.73±1.08% versus 7.56±1.11% at birth. The concentration of SFM increased by 28% and was equal to 26.10±1.22% on the fifth day of life. A significant increase in FEA to 32.11±1.03% by the fifth day was noted compared to the first day - 24.82±1.11%.

The concentration of MDA at birth was 4.18±0.24 nmol /mg lipids, significantly decreasing by the end of the early neonatal period. The revealed changes can be explained by the active participation of lipids in the metabolic adaptation of the newborn. The noted features of the phospholipid spectrum of erythrocyte membranes reflect the structural foundations of ensuring the functional-adaptive reactions of the body and are adaptive in nature.

The results of studies of the lipid spectrum of blood, phospholipids of erythrocyte membranes and LPO indices in healthy newborns from healthy mothers during normal pregnancy and childbirth were accepted by us as the norm and used as a control.

Analysis of the lipid spectrum of blood serum in 15 newborns from mothers suffering from chronic pyelonephritis (Table 2) showed that the cholesterol level was significantly higher both on the first and on the 5th day of life. The triglyceride fraction increased in newborns from mothers with pyelonephritis compared to healthy ones, the same pattern was preserved on the 5th day after birth. An increase in the cholesterol ester fraction compared to the norm is noted. By the end of the early neonatal period, the content of this fraction in newborns of this group was 43.98±981.48%, with a level of 37.38±1.09% in healthy ones. At the same time, there was a tendency to decrease in NEFA to 6.22±1.12% on the first day and to 7.61±1.15% by the fifth day after birth, with a level in healthy individuals of 7.91±1.29 and 8.77±1.28%, respectively. The NEFA/TG ratio in newborns of the

control group was significantly higher than in this group and amounted to 0.684 versus 0.396. Thus, changes in the lipid spectrum in newborns from mothers with pyelonephritis are characterized by pronounced increases in the fraction of cholesterol, triglycerides, cholesterol esters, triglycerides, cholesterol esters and a violation of the ratio of lipid fractions.

Table No. 2

Lipid metabolism indices and phospholipid spectrum of erythrocyte membranes in newborns from mothers with pyelonephritis. (M ± m).

Indicators	Control group (n=22)	Newborns from mothers with pyelonephritis (n=22)	
		1 day of life	5 days of life
OL, g /l	3.17±0.33 4.76±0.5	2.96±0.61 R<0.05	4.52±0.51 R_1>0.05
FL,%	10.31±1.88 14.87±1.12	9.32±1.94 R<0.05	7.93±1.15 R_1<0.05
MDG,%	7.08±1.32 7.91±1.54	4.68±1.65 R<0.05	6.91±1.13 R_1>0.05
SHS,%	15.76±1.13 18.21±1.03	18.96±0.86 R<0.05	21.28±0.63 P_1<0.05
NEFA,%	7.91±1.29 8.77±1.28	6.22±1.12 P<0.05	7.61±1.15 P_1>0.05
TG,%	11.56±1.45 17.61±0.36	16.34±1.51 P<0.01	19.21±0.68 P_1<0.05
EHS,%	40.35±1.10 37.38±1.09	45.44±1.06 P<0.05	43.98±1.48 P_1>0.05
LPH,%	7.56±0.31 13.73±1.08	11.50±0.83 P<0.05	16.21±1.03 P_1<0.05
SFM,%	20.26±1.13 26.10±1.22	23.41±1.03 P<0.05	28.14±1.19 P_1<0.05
FC,%	38.95±1.31 31.21±1.81	29.12±1.03 P>0.05	32.22±1.13 P_1>0.05
FEA,%	24.82±1.11 32.11±1.03	30.68±1.14 P<0.05	30.12±1.18 P_1>0.05

Note: *P - reliability of differences between the indicators of the control group and the group of newborns from mothers with pyelonephritis on day 1; P_1 - on day 5 of life; in the numerator - indicators in healthy newborns on day 1; in the denominator - on day 5 of life.*

On the 5th day of life, the indices of fractions LPH, FH, SFM, and FEA in the group of newborns from mothers with pyelonephritis approached the level of healthy ones.

The concentration of MDA in the group of newborns from mothers with pyelonephritis on the first day of birth was 7.38±0.48 nmol /mg lipid, but remained at a fairly high level on the 5th day after

birth 5.94±0.36 nmol /mg lipid, significantly different from the level of healthy newborns even in the absence of clinically expressed maladaptation syndrome .

In newborns with clinically distinct dysadaptation syndromes (asphyxia, intracranial birth trauma, pneumopathy), the highest level of MDA at birth (8.32±0.29 nmol /mg lipid) and slowly normalized on the 5th day to 6.56±0.32 nmol /mg lipid, which is 2 times higher than normal. Thus, at birth, in newborns of this group, against the background of a reduced fraction of PC, accumulation of the cytotoxic fraction of LPC, SFM is noted, i.e. a tendency to a violation of the ratio of phospholipid fractions is noted. An increase in the fraction of PEA, localized in the deep layers of the biomembrane , apparently affects the degree of membrane permeability and can cause metabolic changes in the cell in newborns from mothers with pyelonephritis, which is accompanied by an increase in LPO products. The revealed changes in lipid metabolism, the phospholipid spectrum of erythrocyte membranes and a violation of lipid peroxidation, reflecting the structural and functional state of cytomembranes , are apparently the result of intrauterine disorders occurring in the fetus against the background of chronic hypoxia associated with the mother's extragenital pathology - pyelonephritis.

A study of umbilical cord blood in newborns from mothers with pyelonephritis complicated by stage 1 gestosis showed that this group of children had a decrease in OL by 23.9%, phospholipid fraction by 11.4%, and MDH by 36.2% on the first day of life, compared to the level in healthy newborns (Table 3).

The content of CXS increased to 18.11±1.08%, while in healthy newborns this indicator was equal to 15.76±1.13%. The concentration of NEFA significantly decreased compared to healthy (3.67±1.63% and 7.9±1.29%). The low content of the NEFA fraction in newborns of the studied group is apparently explained by its use for the synthesis of triglycerides, since this group of newborns showed an increase in triglycerides by 51.6% compared to healthy ones. The fraction of ECHS increased in the group of newborns from mothers with pyelonephritis complicated by gestosis stage 1 to 45.70±1.02%, while the indicator in healthy ones was 40.35±1.10%. The NEFA/TG ratio in newborns of this group decreased to 0.21ë compared to the control (0.65) and the group of newborns from mothers whose pregnancy was complicated by pyelonephritis.

Table No. 3

Lipid metabolism indices in newborns from mothers with pyelonephritis complicated by mild OPG gestosis (M± m).

Indicators	Groups		
	Control group (n=22)	Newborns from mothers with pyelonephritis complicated by grade 1 OPG gestosis (n = 17)	
		1 day of life	5 days of life
OL, g/l	3.17±0.0033 4.76±0.50	2.41±0.54 R<0.05	5.31±0.52 $R_1 < 0.05$ $R_2 < 0.05$
FL,%	10.31±1.88 14.87±1.12	9.14±1.15 R>0.05	8.15 ± 1.14 $R_1 > 0.01$ $R_2 > 0.05$
MDG,%	7.08±1.32 7.91±1.54	4.52±1.18 R<0.05	6.19±1.15 $R_1 > 0.05 R_2 > 0.05$

SHS,%	15.76±1.13 18.21±1.03	18.7±1.08 P<0,05	23.25±1.18 $P_1 < 0,05$ $P_2 < 0,05$
NEC,%	7.91±1.29 8.77±1.28	3.67±1.63 P<0,01	6.92 ± 1.15 $P_1 < 0,05$ $P_2 < 0,05$
TG,%	11.56±1.45 17.61±1.06	17.61±1.20 P<0,01	16.90±1.19 $P_1 < 0.05$ $P_2 < 0.05$
EHS,%	40,35±1,1 37,38±1,09	45,70± 1,02 P<0,05	44,11±1,12 $P_1>0,05$ $P_2<0,05$

Note: *in the numerator - the indicators of healthy newborns on the 1st day, in the denominator - on the 5th day after birth; P - the reliability of differences between newborns from mothers with pyelonephritis complicated by nephropathy and the control group on the 1st day; P_1 -5 days after birth; P_2 - the reliability of differences in newborns of the main group on the 1st and 5th days of life.*

When studying the lipid spectrum on the 5th day after birth, it was noted that the FL fraction decreased compared to healthy ones. The content of CXS increased compared to healthy ones. The NEFA fraction remained reduced by 21% in this group of newborns. The TG level did not differ significantly by the fifth day after birth from the group of healthy newborns.

Thus, at birth, the newborns of this group showed high values of the LPH fraction against the background of a reduced fraction of PC, which is an endogenous antioxidant, i.e. a structural and functional reorganization of cytomembranes was revealed . The MDA content in the newborns of the study group on the first day was increased by 50.2%, on the 5th day by 33.2% against the control.

The changes in LPO indices corresponded to a regular increase in phospholipase activity. Thus, the total phospholipase activity of the blood of newborns from mothers with pyelonephritis without gestosis was 16.3±0.69% hemolysis, in the presence of 2 and 3 degrees of OPG-gestosis 20.4±1.37, and in healthy children 13.9±0.86% hemolysis.

Thus, the impact of infection and toxic factors is accompanied by an increase in the activity of phospholipases, stimulation of LPO and accumulation of the cytotoxic fraction of LPH in the blood of newborns, a decrease in the endogenous bioantioxidant PC, an increase in LPO products (MDA), which have a cytotoxic effect on cell membranes. As a result of changes in the structural and functional properties of cells, their function is disrupted, which leads to aggravation of hypoxia and hypoxemia.

The MDA content in erythrocyte membranes in newborns of the study group at birth was significantly higher compared to newborns from mothers with grade 1 OPG gestosis and the control (9.34±0.21 nmol /mg lipid, 8.32±0.34 and 4.18±0.24 nmol /mg lipid, respectively). The MDA concentration remained high and by the 5th day of life was 5.16±0.42 nmol/mg lipid compared to newborns of the second group - 5.56±0.23 nmol /mg lipid and to healthy children (3.12±0.29 nmol /mg lipid). Its level was the highest on the first day of life in the study group and was equal to 9.34±0.21 nmol/mg lipid versus 8.32±0.34 nmol /mg lipid in the second group and 4.18±0.24 nmol /mg lipid in the control group.

Table No. 4

Lipid metabolism indices, spectrum of erythrocyte membrane phospholipids and lipid peroxidation products in newborns from mothers with pyelonephritis complicated by gestosis of 2 and 3 degrees (M± m)

Groups	Control group (n=22)	Newborns from mothers with pyelonephritis complicated by OPG-gestosis of 2 and 3 degrees (n=16)	
Indicators		1 day of life	5 days of life
OL, g/l	3.17±0.33 4.76±0.50	3.1±0.72 R>0.05	4.23±0.46 R_1 <0.05
FL, %	10.31±0.88 14.87±1.12	8.76±0.59 R0<,05	5.31±0.97 R_1 <0.01
MDG,%	7.08±1.32 7.91±1.54	6.35±0.62 R>0.05	5.11±0.68 R_1 >0.05
SHS,%	15.76±1.13 18.21±1.03	20.45±0.89 R<0.05	24.58±0.81 P_1 <0,01
NEC,%	7.91±1.29 8.77±1.28	3.32±0.42 P<0,01	5.32±0.48 P_1 <0,01
TG,%	11.56±1.45 17.61±1.06	17.37±0.92 P<0,01	19.51±0.71 P_1 >0,05
EHS,%	40.35±1.10 37.38±1.09	44.91±0.73 P<0,05	43.89±1.09 P_1 <0,01
LFC,%	7.56±0.31 13.73±1.08	18.31±0.64 R<0.001	17.82±0.97 R_1 <0.05
SFM,%	20.26±1.13 26.10±1.22	32.37±0.38 R<0.001	24.17±0.88 R_1 >0.05
FH,%	38.95±1.31 31.21±1.81	22.14±0.61 R<0.01	27.87±1.15 R_1 <0.05

Note: *in the numerator - indicators of healthy newborns on the 1st day, in the denominator - on the 5th day after birth; P - reliability of differences between indicators of newborns from mothers with pyelonephritis complicated by gestosis of the 2nd and 3rd degree and the control group on the 1st day, P $_{1-5}$ days after birth.*

Comparison of the phospholipid spectrum of erythrocyte membranes in the study, control, and newborn groups of mothers with pyelonephritis complicated by grade 1 nephropathy showed that the LPH fraction increased even more in the 3rd group of newborns. Moreover, this fraction remained at a high level on the 5th day after birth. The level of SFM in the observed group of newborns was 32.37±0.38%, and in healthy ones - 20.26±1.13%, FEA 31.61±0.52% and 24.82±1.11%. The FH fraction significantly decreased both at birth.

Discussion. Thus, in newborns of mothers with pyelonephritis complicated by grade 2 and 3 OPG-gestosis, profound changes in lipid metabolism were noted, characterized by an increase in CXS, ECS, TG, a decrease in PL, NEFA, the levels of which were high during the early neonatal period. The presence of membranolytic processes accompanied by a high content of cytotoxic LPC, against the background of a decrease in PC, a high level of lipid peroxidation products (MDA) indicate profound disturbances in the structural state of cytomembranes in newborns of mothers with pyelonephritis complicated by grade 2 and 3 gestosis.

From the above it follows that the greatest damaging factor on lipid metabolism and cytomembrane stability are factors leading to chronic intrauterine hypoxia - infection (chronic pyelonephritis in the mother), grade 1 OPG gestosis and especially grades 2 and 3.

Thus, having considered the nature of biochemical homeostasis in newborns with various variants of aggravating factors, it can be concluded that the degree and severity of metabolic imbalance depends on the severity and duration of the pathological process in the mother. The presence of pronounced changes in lipid metabolism, increased content of the cytotoxic fraction of phospholipids, end products of lipid peroxidation indicate profound changes in the structure of cytomembranes in newborns from mothers with chronic pyelonephritis complicated by grade 2-3 OPG gestosis.

Conclusion

Thus, in newborns of mothers with chronic pyelonephritis, “ fetopathy ” is observed, caused by chronic fetal hypoxia, which is expressed by a violation of the stability of cytomembranes : the accumulation of LPC, SF against the background of a decrease in PC, PEA, NEFA, as well as an increase in the level of MDA.

It has been established that the degree of disturbance of homeostatic functions and changes in lipid peroxidation in newborns depends on the severity of aggravating factors during intrauterine development. The combined effects of infection (chronic pyelonephritis) and toxic agents (OPG-gestosis) cause the most profound and persistent disturbances and require special corrective measures.

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МУКОЦИЛИАР ТРАНСПОРТИ НАЗОРАТИ ТЎҒРИСИДАГИ ЗАМОНАВИЙ ҚАРАШЛАР (адабиётлар шарҳи). JOURNAL OF BIOMEDICINE AND PRACTICE, 7(2).

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