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COMPARATIVE ANALYSIS OF ISOLATED EFFECT OF XENOBIOTICS ON RENAL FUNCTIONS IN IMMATURE ANIMALS

Abstract. *For the last few years pollution of our environment by xenobiotic has been expending at a fast rate. It means, that our health and even life of all living beings, included humans, are in danger. It's because, xenobiotics damage cells of the body and bring on mutation, which lead to malignant processes or hereditary diseases. Aluminum and lead belong to the predominant pollutants of biosphere, which cause serious risk for our health. The mechanism laying changes in renal functional activity on the assumption of xenobiotics effect in immature rats has been studied insufficiently.*

Key words: *kidneys, aluminum chloride, lead chloride.*

Introduction. For the last few years pollution of our environment by xenobiotic has been expending at a fast rate [1, 2, 5]. It means, that our health and even life of all living beings, included humans, are in danger. It's because, xenobiotics damage cells of the body and bring on mutation that lead to malignant processes or hereditary diseases. Aluminum and lead belong to the group of predominant pollutants of biosphere, which cause significant risk to our health [3, 7, 8]. The mechanism underlying changes in functional activity of kidneys on the assumption of xenobiotics in immature rats has been studied insufficiently [4, 6, 9].

Objective. To study the isolated effect of aluminum chloride and lead on renal functions in immature rats and to compare changes in indices of renal functions in immature rats under the conditions of xenobiotics.

Materials and methods. Experiments were made on 24 immature nonlinear rats weighing 0,06- 0,10 kg. We studied nephrotoxic-isolated effect of aluminum and lead salts on renal functions. Salts of aluminum and lead were introduced intravenous during 14 days of the

experiment at 8 a.m and 8 p.m, on 1% starch suspension. We used chloride salts mentioned above. Aluminum was introduced in dosage 200 mg/kg and lead in dosage 50 mg/kg of body mass. The excretory renal function was evaluated for absolute and relative size of diuresis, concentration and excretion of sodium and potassium ions in urine, concentration of kreatinine in blood plasma, relative reabsorption of water, concentration of index of endogenous kreatinine, concentration and excretion of protein in urine. In all groups of animals we evaluated the size of diuresis in ml/2 hours/ 100 g of body weight. Acid-secretory function of kidneys was characterized by concentration of active hydrogen ions in urine (pH of urine), excretion of active hydrogen ions, titrated acids and ammonium.

Results and discussions. The analysis of indices of excretory and acid-regulating renal functions in intact immature rats, under the condition of aluminum salts (table 1) has shown, that the level of diuresis in immature rats against the background of aluminum salts introduction was tended to decrease. The concentration and the excretion of potassium ions in urine remained

unchanged. The concentration and the excretion of kreatinine in urine remained unchanged in experimental group. The glomerular filtration was tended to inhibition against the background of aluminum salts introduction in immature rats. The concentration and the excretion of protein in urine were tended to increase against the background of aluminum salts introduction in immature rats. Relative reabsorption of water in experimental group remained without any changes. Although, we didn't find any differences in urine pH and concentration of hydrogen ions in urine. The excretion of titrated acids was tended to inhibition against the background of aluminum salts introduction. It was detected the tendency

for a decrease of ammonium excretion and relative decrease of ammonium ratio during aluminum salts introduction in immature rats.

Changes in indices of excretory and acid-regulating renal functions in immature rats, under the condition of lead salts (table 2) has shown, that the level of diuresis in immature rats against the background of lead salts introduction was tended to decrease. Indices of concentration and excretion of potassium ions in urine remained unchanged. The concentration and excretion of kreatinine in urine also remained unchanged. The concentration of protein in urine tended to increase, while the excretion of protein under the background of lead salts introduction remained

Table 1.

Indices of renal functions in immature rats under the conditions of aluminum salts effect. ($\bar{x} \pm S_x$)

Indices	Immature rats (Al) (n=6)	Control (n=6)
Diuresis, ml/2 h 100g	1,64±0,168	2,21±0,27
Concentration of potassium ions in urine, mmol/l	13,44±2,45	14,35±1,704
Excretion of potassium ions, mcmol/2 h · 100 g	19,84±5,796	27,62±6,651
Concentration of kreatinine in urine, mmol/l	0,78±0,116	0,65±0,041
Concentration of protein, g/l	0,24±0,019	0,065±0,001 p<0,001
Excretion of protein, mg/ 2 h · 100 g	0,39±0,039	0,14±0,019 p<0,001
Excretion of filtrated acids, mcmol/m · 100 g	4,66±0,832	14,2±3,12 p<0,02
Ammonium excretion, mcmol/m · 100 g	250,8±60,04	39,84±9,75
Ammonium ratio, convetional units.	5,2±0,325	2,64±0,311 p<0,001

Table 2

Indices of renal functions in immature rats under the conditions of lead salts effect. ($\bar{x} \pm S_x$)

Indices	Immature rats (Pb) (n=6)	Control (n=6)
Diuresis, ml/2 h · 100 g	1,46±0,471	2,21±0,27
Concentration of potassium ions in urine, mmol/l	13,0±0,928	14,35±1,704
Excretion of potassium ions, mcmol/2 h · 100 g	16,08±5,543	27,62±6,651
Concentration of kreatinine in urine, mmol/l	0,74±0,042	0,65±0,041
Excretion of kreatinine, mcmol/2h · 100 g	1,01±0,261	1,43±0,183
Glomerulus filtration, mcl/m · 100 g	931,7±32,73	200,6±43,55 p<0,001
Concentration of protein in urine, g/l	0,10±0,010	0,067±0,001 p<0,05
Concentration pf hydrogen ions in urine, mcmol/l	0,79±0,013	0,79±0,005
Excretion of titrated acids, mcmol/m · 100 g	5,39±2,281	14,2±3,12 p<0,05
Excretion of ammonium, mcmol/m · 100 g	151,2±59,44	39,84±9,75
Ammonium ratio, conventional units.	2,93±0,154	2,64±0,311

within normal limits. Besides, we didn't find any changes in urine pH and concentration of hydrogen ions. The excretion of titrated acids was inhibited by the introduction of lead salts. We established the tendency to increase in ammonium excretion and its ratio during introduction of lead salts in immature rats.

Analysis of the parameters of excretory and acid-regulating of renal functions in immature rats under the condition of aluminum and lead salts effect (table 3) has shown that the level of diuresis, concentration and excretion of potassium ions, concentration of kreatinine in urine didn't change much, upon condition of aluminum salts effect, as to the lead salts. Indices of kreatinine concentration in urine were higher

under the conditions of aluminum salts, however the excretion was lower during aluminum salts introduction, as to the group of animals that received lead chloride. Glomerulus filtration remained unchanged. Indices of protein concentration in urine remained within normal limits in experimental group. Indicators of protein concentration in urine remained unchanged in the comparison groups, its excretion and relative reabsorption of water increased under the conditions aluminum salts introduction, in comparison with the group of animals that were taken by the lead salts. Indices of ammonium ratio and urine pH had a tendency to decrease, under the conditions of aluminum salts introduction, as to the control.

Table 3

Indices of ion regulative renal functions in immature rats under the conditions of aluminum and lead salts effect. ($\bar{x} \pm S_x$)

Indices	Immature rats (Al) (n=6)	Immature rats (Pb) (n=6)
Diuresis, ml/2 h 100 g	1,97±0,314	2,68±0,342
Concentration of potassium ions in urine, mmol/l	19,4±3,41	23,5±5,85
Excretion of potassium ions, mcmol/2 h 100 g	32,49±9,14	46,07±13,04
Concentration of kreatinine in urine, mmol/l	0,63±0,128	0,54±0,093
Excretion of kreatinine, mcmol/2h 100 g	1,22±0,217	1,42±0,303
Glomerulus filtration, mcl/m 100 g	189,1±51,23	201,53±32,12
Concentration of protein in urine, g/l	0,24±0,019	0,24±0,017
Excretion of protein, mg/ 2 h 100 g	0,45±0,049	0,63±0,091
Relative reabsorption of water, %	91,1±1,493	90,2±1,807
Urine pH, conventional units.	6,25±0,197	6,2±0,2
Concentration of hydrogen ions in urine, mcmol/l	0,79±0,013	0,79±0,013
Excretion of titrated acids, mcmol/m·100 g	20,6±6,78	18,3±3,16
Excretion of ammonium, mcmol/m·100 g	254,7±71,95	245,1±38,6
Ammonium ratio, conventional units.	1,46±0,188	1,34±0,036

Conclusions: Thus, the analysis of isolated effect of aluminum and lead salts on excretory and acid-regulating renal functions in immature rats has shown, that investigated environmental load is accompanied by nephrotoxic action, which is explained by lack maturity of renal glomerulus and peculiarities of development of distal nephron in ontogenesis.

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