Pathophysiological analysis of diagnostics of urine organic osmolytes using "IMEDIS-TEST +" in conditions of water-induced diuresis and load with 3% sodium chloride solution

Yu.E. Rogovy, L.G. Arkhipova, I.L. Muravyova, A.V. Bocharov
(Bukovina State Medical University, Regional Medical Diagnostic Center, Chernivtsi, Ukraine; Center "IMEDIS", Moscow, Russia)

Purpose of the study: to find out the possibilities of diagnosing the concentration of organic osmolytes of urine using the vegetative resonance test (ART) "IMEDIS-TEST +" in conditions of water diuresis and loading with 3% sodium chloride solution.

It is known that with water-induced diuresis, the kidneys operate in the mode of excretion of osmotically diluted urine (minimum level of ADH), the osmolarity of which is about 50 mosm / kg, and under a load of 3% sodium chloride solution, in the mode of excretion of osmotically concentrated urine with osmolarity 1200 mosm / kg (maximum ADH level). In these modes, the osmolarity of the renal papilla corresponds to the osmolarity of urine. An increase in the osmolarity of the interstitium of the renal papilla is due to an increase in the concentrations of sodium, chlorine, potassium, and urea ions. The cells of the renal papilla are protected from hyperosmia of the environment by organic osmolytes, an increase in the concentration of which in the urine was detected using ART "IMEDIS-TEST +" in rats under a load of 3% sodium chloride solution in comparison with the regime of water diuresis. So,

Table 1

The concentration of organic osmolytes in urine during water-induced urination and loading with 3% sodium chloride solution in the study of rats with using ART "IMEDIS-TEST +" (x Sx)

Indicators	Water diuresis (n = 6)	Load with 3% solution NaCl (n = 6)
Betaine, conventional unit	3.37 0.182	10.37 0.323 p <0.001
Taurine, conventional unit	3.62 0.183	9.37 0.182 p <0.001
Sorbitol, conventional unit	3.00 0.000	9.00 ,000 p <0.001
Glycine, conventional units	3.25 0.163	9.00 0.188 p <0.001
Proline, conventional units	3.12 0.125	9.62 0.182 p <0.001
Glutamine, conventional units	3.37 0.182	8.50 0.189 p <0.001
L-asparagine, conventional unit	2.12 0.125	9.12 0.125 p <0.001

p - reliability of differences in comparison with aqueous diuresis; n is the number of observations.

An increase in the concentration of organic osmolytes was combined with an increase in the concentration of heparin, bombesin, vasointestinal peptide (VIP), and cAMP in urine (Table 2). In addition, positive correlations were revealed under conditions of loading with a 3% sodium chloride solution between urine betaine - urine VIP, betaine urine - urine glutamine, PGE_2 urine - urine glutamine, PGE_2 urine - urine L-arginine, urine L-arginine - urine glutamine (Table 3). Increased urine heparin

under a load of 3% sodium chloride solution in comparison with the mode of water diuresis is due to the ability of heparin to reduce the permeability of the interstitium to sodium ions with the development of natriuresis, an increase in the level of bombesin reflects the activation of the renin-angiotensin system in response to an increase in the delivery of sodium ions to the macula densa.

table 2

The concentration of heparin, VIP, bombesin, cAMP in urine with water-induced urination and loading with 3% sodium chloride solution with study of rats using ART "IMEDIS-TEST +" (x Sx)

Indicators	Water diuresis (n = 6)	Load with 3% solution NaCl (n = 6)
Heparin, conventional unit	4.37 0.182	8.25 0.163 p <0.001
VIP, conventional units	4.12 0.125	15.00 0.267 p <0.001
Bombesin, conventional unit	3.00 0.000	9.00 0.000 p <0.001
cAMP, conventional units	1.00 0.000	4.87 0.125 p <0.001

Table 3

Correlation analysis of relationships between PGE concentrations2, L-arginine, VIP, organic osmolytes in urine at 3% load sodium chloride solution in the study of rats using ART "IMEDIS-TEST + "(x Sx)

Pairs of correlation connections	Coefficient correlation, r	Credibility correlation
Betaine urine - VIP urine	0.825	p <0.02
Betaine urine - glutamine urine	0.729	p <0.05
PGE2 urine - glutamine urine	0.707	p <0.05
PGE2 urine - L-arginine urine L-arginine urine - glutamine urine	0.905	p <0.01
	0.800	p <0.02

An increase in VIP concentration contributes to the restructuring of renal function to a mode of escape from sodium ions due to an increase in glomerular filtration due to vasodilation of the lumen arteriole and a decrease in sodium ion reabsorption. The increase in the concentration of cAMP is due to the increase in the level of ADH in the hyper sodium regime. The positive correlation between VIP and urine betaine is probably due to the ability of VIP to enhance betaine production. Correlation links between urine betaine - urine glutamine, urine L-arginine - urine glutamine are due to a combined increase in the synthesis of organic osmolytes in response to hyperosmia. Revealed positive correlations between PGE2 urine - urine glutamine, PGE2 urine - urine L-arginine can probably be explained by the fact that natriuretic reaction due to the influence of PGE2 accompanied by an increase in the production of these organic osmolytes.

Conclusions:

1. The revealed increase in the concentration of organic betaine osmolytes, taurine, glycine, sorbitol, proline, glutamine, L-asparagine in urine under conditions of loading with 3% sodium chloride solution in comparison with the regime of water diuresis corresponds to the restructuring of the functional state of the renal papilla when comparing

mode of the maximum level of ADH (osmolarity of urine 1200 mosm / kg) in comparison with the minimum level of ADH in conditions of water diuresis (urine osmolarity 50 mosm / kg).

2. An increase in the concentration of VIP in urine under conditions of loading with a 3% solution sodium chloride in comparison with the regime of water diuresis is aimed at restructuring the functional state of the kidneys to the regime of escape from sodium by increasing glomerular filtration and reducing the reabsorption of this cation in the tubules.

Yu.E. Rogovy, L.G. Arkhipova, I.L. Muravyova, A.V. Bocharov Pathophysiological analysis of diagnostics of urine organic osmolytes using "IMEDIS-TEST +" under conditions of water-induced diuresis and loading with 3% sodium chloride solution // XII