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FEATURES OF METABOLIC REACTIONS TO VARIOUS WATER-SALT LOADS IN FEMALE RATS

Anatoliy I Gozhenko[1], Yuriy V Zavidnyuk[1, 2], Nataliya I Sydliaruk[2], Igor R Mysula[2], Ivan M Klishch[2], Walery Zukow[3], Igor L Popovych[4], Mykhaylo M Korda[2]

[1]Ukrainian Scientific Research Institute of Transport Medicine, Odesa, Ukraine, prof.gozhenko@gmail.com
[2]IY Horbachevs'kyi State Medical University, Ternopil', Ukraine, zavidnyukyv@tdmu.edu.ua
[3]Department of Spatial Management and Tourism, Faculty of Earth Sciences, Nicolaus Copernicus University, Torun, Poland w.zukow@wp.pl
[4]OO Bohomolets' Institute of Physiology, Kyiv, Ukraine, i.popovych@biph.kiev.ua

Abstract

Background. In the previous article we reported that screening registered parameters of water-salt, nitrous and lipid metabolism as well as the neuroendocrine-immune complex found 42 among them who in rats subjected to various water-salt loads, significantly different from that of intact rats, but on average the same group of animals that received liquids with different mineralization and chemical composition. The purpose of this article is to find out the **features** of the reactions of the parameters of metabolism. **Materials and methods.** Experiment was performed on 58 healthy female Wistar rats 240-290 g divided into 6 groups. Animals of the first group remained intact, using tap water from drinking ad libitum. Instead, the other rats received the same tap water as well as waters Sophiya, Naftussya, Gertsa and its artificial salt analogue through the probe at a dose of 1,5 mL/100 g of body mass for 6 days. The day after the completion of the drinking course in all rats the parameters of water-salt, nitrous and lipid metabolism were registered. **Results.** Found that 16 metabolic parameters the maximum deviates from the level of intact rats under the influence of the salt analogue of Gertsa water, a smaller, but tangible effect is made by the Gertsa native water, even less effective waters Sofiya and Naftussya, instead of ordinary water is almost ineffective in relation to these metabolic parameters. The other 19 parameters deviates to a maximum extent from the reference level after the use of water Naftussya, fresh water is less effective, whereas quasi-isotonic liquids are practically inactive for these parameters. The remaining 13 parameters in animals that use normal water, deviates from intact control to the same extent as in the previous pattern, which, apparently, is also due to the stressful effects of the load course. Both Naftussya and Gertsa water and its salt analogue prevent the stress deviations of these parameters. Instead, by consumption of water Sofiya stresses deviations of these

parameters is reversed. The method of discriminant analysis revealed 33 variables (among them 8 refer to plasma/erythrocytes electrolytes, 7 to electrolytes of urine, to other metabolic parameters of plasma 5 and urine 9, as well as glomerular filtration, canalicular reabsorption, diurese and urine osmolarity), the totality of which the metabolic reactions to various water-salt loads are identified (recognized) with an accuracy of 98,3%. **Conclusion.** The features of the reactions of the parameters of metabolism are due to the content in waters NaCl, SO_4^{2-} as well as organic carbon and nitrogen.

Keywords. Water-salt loads, water-salt, nitrous and lipid metabolism, female rats.

INTRODUCTION

In the previous article [16], we reported that screening registered parameters of water-salt, nitrous and lipid metabolism as well as the neuroendocrine-immune complex found 42 among them who in rats subjected to various water-salt loads, significantly different from that of intact rats, but on average the same group of animals that received liquids with different mineralization and chemical composition. Most heavily grown is glomerular filtration and mineralocorticoid activity, which is evaluated by the exchange of sodium and potassium, the activity of catalase plasma and urine, as well as the plasma testosterone, urea and malonic dialdehyde levels. Further, in the ranking, follow: urine excretion of calcium and associated with it and calciumemia calcitonin activity, as well as excretion of creatinine, magnesium and urea, concentration of creatinine in urine and plasma, urea concentration in urine and plasma glucose. Among the immune parameters, the content in the thymocytogram of endotheliocytes and the Hassalle body increases, while in the splenocytogram reticulocytes, as well as the index of killing by neutrophils Staph. aureus. In addition, increased diuresis, adrenals mass and triiodothyronine levels were found. Instead, decreases the weight of the spleen, the relative content in the thymocytogram of the epitheliocytes, lymphoblasts and lymphocytes, in the blood of eosinophils and stub neutrophils, in splenocytogram plasmocytes, as well as microbial number of neutrophils. In urine, the concentration of medium mass molecules and potassium decreases. The maximum level of potassium and calcium in plasma is reduced. Thus, takes place nonspecific (general) reaction neuroendocrine-immune complex and metabolism in water-salt load as such, regardless of the specific chemical composition of fluids applied. After revealing the parameters, changes which are common to the water-salt loads of different chemical composition, consider the specific manifestations of balneoreaction. The purpose of this article is to find out the features of the reactions of the parameters of metabolism.

MATERIAL AND METHODS

Experiment was performed on 58 healthy female Wistar rats 240-290 g divided into 6 groups. Animals of the first group remained intact, using tap water from drinking ad libitum. Rats of the second (control) group for 6 days administered a single tap water through the probe at a dose of 1,5 mL/100 g of body mass. In the third group (reference for the organic component) was given daily drinking of animals with water Naftussya from the Truskavets' layer, in the fourth group (reference to the salt component) the rats were watered with the water Sophiya of the Truskavets' field. The rats of the main group received the native water from the Gertsa field, and the second control group its artificial salt analogue. The chemical composition of the applied waters (according to Truskavetsian Hydrogeological Regime-operational Station data) is given in Table 1.

Table 1. The chemical composition of the applied mineral waters

	Daily Water	Sofiya	Gertsa	Salt analog	Naftussya
Electrolytes, mM/L					
Na^+	0,5	156	196,7	196,7	0,6
Cl^-	3,4	142	205	205	1,0
HCO_3^-	2,9	7,5	5,6	5,6	8,2
Ca^{2+}	3,4	5,3	3,40	3,40	2,9
Mg^{2+}	0,5	4,3	3,44	3,44	2,3
K^+	0,4	0,3	0,4	0,4	0,3
SO_4^{2-}	1,2	13,1	0,1	0,1	1,0
Trace elementes, mg/L					
H_2SiO_3	5	4,43	9,88	0	9,5
H_3BO_3	0,25	8,39	42,76	0	0,200
Br	8,3	6,7	21,17	0	0,034
J	0,025	1,29	6,62	0	0,004
F	0,95	0,52	0,57	0	0,160
Organic substances, mg/L					
C org	5,0	5,5	34	0	12,8
N org	0,02	0,8	0,14	0	0,33

The day after the completion of the drinking course animals were placed in individual chambers with perforated bottom for collecting daily urine. The experiment was completed by decapitation of rats in order to collect as much blood as possible.

We determined the plasma levels of the electrolytes: calcium (by reaction with arsenase III), magnesium (by reaction with colgamite), phosphates (phosphate-molybdate method), chloride (mercury-rhodanidine method), sodium and potassium (both in plasma and in erythrocytes) by flamming photometry; nitric metabolites: creatinine (by Jaffe's color reaction by Popper's method), urea (urease method by reaction with phenolhypochlorite), uric acid (uricase method), medium molecular polypeptides (by spectrophotometric method), bilirubin (by diazoreaction using the Jedrashik-Kleghorn-Grof method); lipid peroxidation products: diene conjugates (spectrophotometry of the heptane phase of the lipids extract) and malonic dialdehyde (in the test with thiobarbituric acid), antioxidant enzymes: superoxide dismutase erythrocytes (according to the degree of inhibition of reduction of nitroblue tetrazolium in the presence of N-methylphenazonium metasulphate and NADH) and catalase plasma (at the rate of decomposition of hydrogen peroxide), as well as amylase (Karavay's amyloclastic method with starch substrate) and glucose (glucose-oxidase method).

Most of the listed parameters of metabolism were also determined in daily urine. By the size of the diuresis and the level of creatinine in plasma and urine, glomerular filtration and canalicular reabsorption were calculated. In addition, the osmolarity of the urine was measured by the cryostatic method.

The analyzes were carried out according to the instructions described in the manual [4]. The analyzers "Pointe-180" ("Scientific", USA) and "Reflotron" (Boehringer Mannheim, BRD) were used with appropriate sets and a flamming spectrophotometer "СФ-47".

Digital material is statistically processed on a computer using the software package "Statistica 5.5".

RESULTS AND DISCUSION

In the first stage of the analysis, all registered parameters were divided into 6 patterns. The pattern is a characteristic sequence of localization of rats in a plane whose Y axis represents the mean of the Z-scores. At the second stage of the analysis, the quasi-mirror patterns were paired.

The first pattern (Table 2 and Fig. 1) combines nine parameters, the average Z-scores which is maximal for rats that received artificial saline analogue of mineral water Gertsa and dominates this natural mineral water. Next, the therapeutic waters Sofia and Naftussya, as well as daily water, whose effects on these parameters are approximately equally moderate.

Significantly, that most likely to increase are glomerular filtration and excretion of creatinine and urea, as well as diuresis. Back in 2004, we showed that one-time loading with 0,5% solution NaCl (5 mL/kg of body mass) as compared with daily water load is followed immediately by reliably increased excretion of creatinine and nitrous metabolites at healthy volunteers [5]. A simple recount shows that in the Gertsa native water the concentration of NaCl is 1,28% and in Sofiya water is 0,86%. Nevertheless, their influence on these parameters of the kidneys is much weaker, due, apparently, to the presence in their composition of sulphate and/or of trace elements and organic substances. Contrary to the expectation inspired by extensive literature [1-3,6-9,11-23], the influence of Naftussya water on diuresis and urine excretion of metabolites was weaker.

The second pattern combines seven parameters, the mean Z-score of which, by contrast, is minimal in similar circumstances, while under the influence of other loads, they decrease to a lesser extent. First of all, it is the concentration of potassium in urine, as well as phosphates and medium molecules.

Configurations of patterns are close to mirror, which became the basis for their visualization on a common plane.

Table 2. The first pair of patterns of reactions of metabolic parameters to water-salt loadings

Variables	Salt Anal G (8)	MW Gertsa (11)	MW Sofiya (10)	Naftu ssya (9)	Daily Water (10)	Intact rats (10)
Glomerulary Filtration, µL/min•100 g Body Mass	194 2,26 +1,75	142 1,65 +0,91	112 1,30 +0,41	109 1,27 +0,38	86,5 1,01 +0,01	85,9 1 0
Creatinine Excretion, µM/24h•100 g Body Mass	16,03 1,84 +1,68	10,53 1,21 +0,42	12,30 1,41 +0,82	12,27 1,41 +0,82	10,12 1,16 +0,32	8,72 1 0
Katalase Urine, nM/h•mL	163 1,33 +1,47	141 1,15 +0,65	136 1,11 +0,48	145 1,18 +0,80	151 1,23 +1,04	123 1 0
Urea Excretion, µM/24h•100 g Body Mass	315 1,86 +1,08	283 1,68 +0,85	192 1,14 +0,17	201 1,19 +0,24	164 0,97 -0,04	169 1 0
Diurese, mL/24h•100 g Body Mass	2,37 1,65 +1,05	1,66 1,15 +0,25	1,53 1,06 +0,10	1,65 1,14 +0,23	1,44 1,00 0,00	1,44 1 0
Diene conjugates Plasma, E^{232}/mL	1,63 1,21 +0,72	1,65 1,23 +0,76	1,30 0,96 -0,13	1,31 0,97 -0,10	1,45 1,08 +0,25	1,35 1 0
Glukose Plasma, mM/L	5,76 1,16 +0,74	5,15 1,04 +0,19	5,31 1,07 +0,33	5,32 1,08 +0,34	5,61 1,13 +0,60	4,95 1 0
Phosphates Excretion, µM/24h•100 g Body Mass	137 1,46 +0,69	108 1,15 +0,23	92 0,98 -0,03	104 1,11 +0,16	93 0,99 -0,01	94 1 0
Urea Urine, mM/L	129 1,20 +0,52	141 1,32 +0,83	122 1,14 +0,36	118 1,10 +0,27	104 0,97 -0,08	107 1 0
Pattern I (9)	**+1,08 ±0,15**	**+0,57 ±0,10**	**+0,28 ±0,10**	**+0,35 ±0,10**	**+0,23 ±0,13**	**0**
Potassium Urine, mM/L	95 0,73 -0,91	122 0,93 -0,23	128 0,98 -0,08	104 0,79 -0,70	125 0,96 -0,14	131 1 0
Middle Mass Molecules Urine, units	147 0,80 -0,68	165 0,91 -0,32	159 0,87 -0,44	159 0,87 -0,44	181 0,99 -0,02	182 1 0
Phosphates Urine, mM/L	58,9 0,92 -0,64	62,6 0,98 -0,16	61,3 0,96 -0,33	63,8 1,00 -0,01	63,5 0,99 -0,05	63,9 1 0
Potassium Plasma, mM/L	3,82 0,90 -0,58	3,35 0,79 -1,25	3,12 0,74 -1,58	3,86 0,91 -0,53	3,71 0,88 -0,73	4,23 1 0
Superoxide Dismutase Plasma, units/mL	53,3 0,92 -0,44	51,4 0,89 -0,62	57,8 1,00 -0,02	56,8 0,98 -0,12	56,3 0,97 -0,16	58,0 1 0
Superoxide Dismutase Urine, units/mL	59,9 0,98 -0,27	59,8 0,97 -0,29	62,6 1,02 +0,24	59,6 0,97 -0,33	62,7 1,02 +0,26	61,3 1 0
Bilirubine Plasma, µM/L	3,94 0,85 -0,27	4,77 1,03 +0,06	4,20 0,91 -0,17	4,70 1,02 +0,03	5,04 1,09 +0,16	4,63 1 0
Pattern II (7)	**-0,54 ±0,09**	**-0,40 ±0,16**	**-0,34 ±0,22**	**-0,30 ±0,10**	**-0,10 ±0,12**	**0**

Notes.

1. In each graph, the first line is the actual mean values, the second line is the portion of the average value of the intact group (L/I), the third row is Z=(L/I-1)/Cv.
2. Patterns display average values of Z and their standard errors.

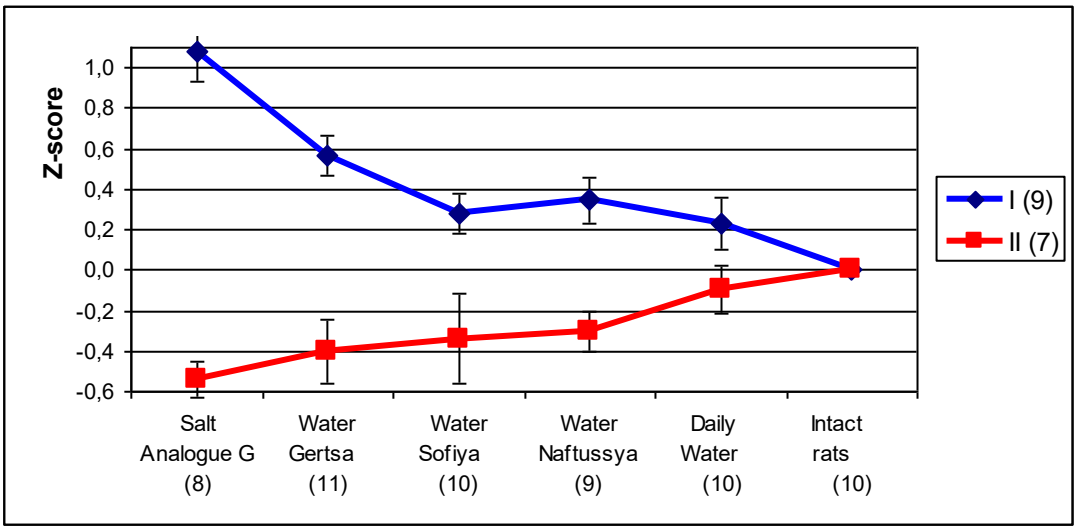

Fig. 1. The first pair of patterns of reactions of metabolic parameters to water-salt loads

The second pattern (Table 3 and Figure 2) combines 12 parameters, the mean of Z-score which is reduced to a greater extent under the influence of bioactive water of Naftussya and less noticeable in the rats receiving daily water from the tap, while the tendency towards increasing is in animals, which received the mineral waters Sofiya and Gertsa and significantly increased under the influence of the salt analogue of the latter.

Mostly, the excretion and concentration in urine of sodium and chloride decreases, which leads to a decrease in the osmolarity of the urine. In addition, the content in the urine of diene conjugates, in the plasma of uric acid and calcium, in erythrocytes of sodium and potassium is reduced, as well as tubular reabsorption of water.

On the opposite end of the pattern, on the contrary, the opposite changes in these parameters are reflected, with the exception of a significant increase in urinary concentration of chloride and potassium and caused by these ions the urinary osmolality, as well as the concentration in calcium plasma.

Table 3. The second pair of patterns of reactions of metabolic parameters to water-salt loadings

Variables	Salt Anal G (8)	MW Gertsa (11)	MW Sofiya (10)	Intact rats (10)	Daily Water (10)	Naftussya (9)
Osmolarity Urine, mOsm/L	581 1,04 +0,16	623 1,11 +0,46	598 1,07 +0,28	559 1 0	464 0,83 -0,69	424 0,76 -0,98
Sodium Excretion, µM/24h•100 g Body Mass	282 2,09 +1,75	225 1,67 +1,08	175 1,30 +0,48	135 1 0	89 0,66 -0,54	66 0,49 -0,81
Chloride Excretion, µM/24h•100 g Body Mass	244 1,69 +1,01	203 1,41 +0,60	195 1,35 +0,52	144 1 0	102 0,71 -0,43	66 0,46 -0,80
Sodium Urine, mM/L	135 1,28 +0,45	128 1,22 +0,34	117 1,11 +0,18	105 1 0	64 0,61 -0,62	53 0,50 -0,78
Chloride Urine, mM/L	129 1,12 +0,17	132 1,15 +0,21	133 1,15 +0,22	115 1 0	69 0,61 -0,56	47 0,41 -0,85
Calcium Plasma, mM/L	3,36 1,00 +0,01	2,32 0,69 -1,01	2,57 0,77 -0,76	3,35 1 0	1,88 0,56 -1,44	2,44 0,73 -0,89
Diene conjugates Urine, E^{232}/mL	2,14 1,15 +0,43	1,66 0,89 -0,30	1,90 1,03 +0,07	1,86 1 0	1,70 0,92 -0,23	1,45 0,78 -0,61
Uric Acid Plasma, µM/L	781 1,18 +0,35	935 1,41 +0,80	550 0,83 -0,33	662 1 0	716 1,08 +0,16	504 0,76 -0,46
Potassium Erythrocytes, mM/L	90,1 1,04 +0,46	85,8 0,99 -0,18	88,5 1,02 +0,21	87,0 1 0	86,9 1,00 -0,02	83,9 0,96 -0,45
Sodium Erythrocytes, mM/L	25,5 1,16 +0,78	22,7 1,03 +0,16	21,8 0,99 -0,04	22,0 1 0	23,7 1,08 +0,38	20,6 0,93 -0,33
Canalicular Reabsorbtion, %	98,8 1,00 +0,11	99,0 1,00 +0,33	98,9 1,00 +0,24	98,7 1 0	98,7 1,00 -0,02	98,5 1,00 -0,27
Potassium Excretion, µM/24h•100 g Body Mass	197 1,04 +0,07	173 0,92 -0,13	189 1,00 +0,01	189 1 0	191 1,01 +0,02	179 0,95 -0,08
Pattern III (12)	**+0,48 ±0,14**	**+0,20 ±0,16**	**+0,09 ±0,10**	**0**	**-0,33 ±0,14**	**-0,61 ±0,09**
Calcium Urine, mM/L	1,93 0,92 -0,44	2,32 1,11 +0,59	2,07 0,99 -0,07	2,10 1 0	2,15 1,02 +0,13	3,05 1,46 +2,55
Calcium Excretion, µM/24h•100 g Body Mass	4,50 1,55 +1,05	4,25 1,47 +0,88	3,09 1,07 +0,13	2,90 1 0	3,08 1,06 +0,12	4,76 1,64 +1,22
Urea Plasma, mM/L	7,44 1,00 +0,01	7,85 1,06 +0,25	9,29 1,25 +1,09	7,42 1 0	8,92 1,20 +0,88	10,03 1,35 +1,52
Katalase Plasma, nM/h•mL	135 1,30 +1,12	122 1,18 +0,66	120 1,16 +0,60	103 1 0	145 1,40 +1,49	142 1,37 +1,38
Creatinine Plasma, µM/L	73 1,01 -0,04	68 0,94 -0,18	90 1,24 +0,72	73 1 0	86 1,18 +0,55	98 1,35 +1,04
Cholesterol Plasma, mM/L	1,46 0,93 -0,23	1,53 0,97 -0,09	1,62 1,03 +0,11	1,57 1 0	1,60 1,02 +0,06	1,67 1,06 +0,21
Amylase Urine, mg/h•mL	181 0,90 -0,39	215 1,06 +0,23	210 1,04 +0,14	202 1 0	212 1,05 +0,18	210 1,04 +0,15
Pattern IV (7)	**+0,15 ±0,25**	**+0,33 ±0,15**	**+0,39 ±0,16**	**0**	**+0,49 ±0,20**	**+1,15 ±0,31**

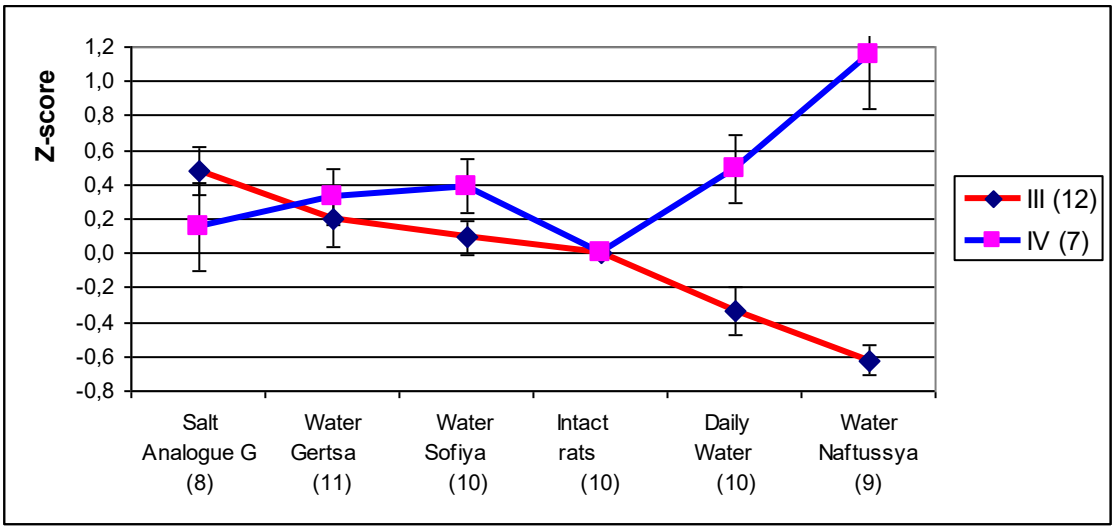

Fig. 2. The second pair of patterns of reactions of metabolic parameters to water-salt loads

The fifth pattern (Table 5 and Figure 3) combines 6 parameters, the mean value of Z which increases significantly under the influence of Sofiya water. Urinary excretion and concentration of magnesium, as well as the concentration of creatinine in urine and plasma amylase activity, are the most prevalent, while phosphateemia and urine concentration of malonic dialdehyde are slightly increased. Under the influence of Naftussya water, the average Z value tends to increase, whereas neither Gertsa native water nor its salt analogue causes significant changes in these parameters, while daily water causes a weak tendency to decrease them.

The sixth pattern, mirrored to the fifth, reflects the maximum drop in plasma chloride and middle mass molecules levels, urinary concentration and excretion of uric acid, as well as the tendency towards a decrease in the plasma level of malonic dialdehyde, sodium and magnesium. Instead, under the influence of water from the crane, these parameters increase to varying degrees, without reacting substantially to Gertsa native water or to its salt analogue.

Table 4. The third pair of patterns of reactions of metabolic parameters to water-salt loadings

Variables	Daily Water (10)	MW Gertsa (11)	Intact rats (10)	Salt Anal G (8)	Naftu ssya (9)	MW Sofiya (10)
Magnesium Excretion, µM/24h•100 g Body Mass	2,65 0,80 -0,31	2,51 0,76 -0,38	3,30 1 0	5,85 1,77 +1,23	5,07 1,54 +0,85	5,98 1,81 +1,29
Magnesium Urine, mM/L	1,90 0,74 -0,37	1,73 0,68 -0,47	2,56 1 0	2,54 0,99 -0,01	3,27 1,26 +0,38	4,09 1,60 +0,86
Creatinine Urine, mM/L	7,15 1,12 +0,40	6,83 1,07 +0,23	6,41 1 0	7,01 1,09 +0,32	7,16 1,12 +0,41	8,12 1,27 +0,93
Amylase Plasma, mg/h•mL	145 0,96 -0,27	163 1,07 +0,45	152 1 0	134 0,88 -0,73	152 1,00 -0,01	171 1,13 +0,78
Phosphate Plasma, mM/L	0,87 0,84 -0,27	0,72 0,69 -0,52	1,04 1 0	0,92 0,88 -0,20	0,88 0,85 -0,26	1,22 1,18 +0,30
Malonic Dialdehyde Urine, µM/L	77 0,83 -0,36	91 0,99 -0,03	92 1 0	81 0,88 -0,25	87 0,95 -0,11	102 1,10 +0,22
Pattern V (6)	**-0,20 ±0,12**	**-0,12 ±0,16**	**0**	**+0,06 ±0,27**	**+0,21 ±0,17**	**+0,78 ±0,17**
Chloride Plasma, mM/L	95,0 1,01 +0,20	91,5 0,98 -0,38	93,8 1 0	92,9 0,99 -0,14	93,2 0,99 -0,10	89,7 0,96 -0,67
Middle Mass Molecules Plasma, units	193 1,25 +0,76	119 0,78 -0,67	154 1 0	148 0,96 -0,11	134 0,87 -0,38	126 0,82 -0,55
Uric Acid Urine, mM/L	4,70 1,28 +0,55	4,23 1,15 +0,30	3,68 1 0	2,91 0,79 -0,42	3,18 0,86 -0,27	2,56 0,69 -0,61
Uric Acid Excretion, µM/24h•100 g Body Mass	6,7 1,16 +0,18	6,0 1,04 +0,04	5,7 1 0	6,5 1,14 +0,15	4,9 0,86 -0,15	3,8 0,66 -0,36
Malonic Dialdehyde Plasma, µM/L	92 1,45 +1,30	81 1,28 +0,83	63 1 0	62 0,97 -0,08	80 1,26 +0,76	57 0,91 -0,27
Sodium Plasma, mM/L	131,8 1,03 +0,40	128,6 1,00 +0,01	128,6 1 0	127,8 0,99 -0,09	129,9 1,01 +0,16	127,0 0,99 -0,19
Magnesium Plasma, mM/L	1,05 1,19 +0,28	0,70 0,80 -0,29	0,88 1 0	0,79 0,89 -0,16	0,90 1,02 +0,03	0,80 0,90 -0,14
Pattern VI (7)	**+0,52 ±0,15**	**-0,02 ±0,19**	**0**	**-0,12 ±0,07**	**+0,01 ±0,14**	**-0,40 ±0,08**

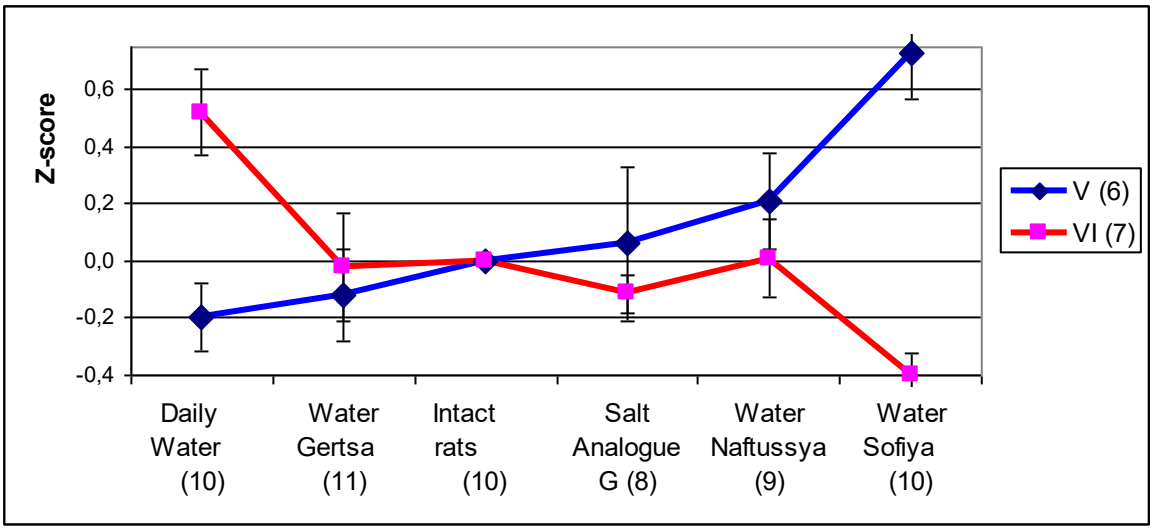

Fig. 3. The third pair of patterns of reactions of metabolic parameters to water-salt loads

At the next stage of the analysis, three pairs of mirror patterns were doubled and modulated by the reaction of the parameters to the dominant stimulus (Fig. 4).

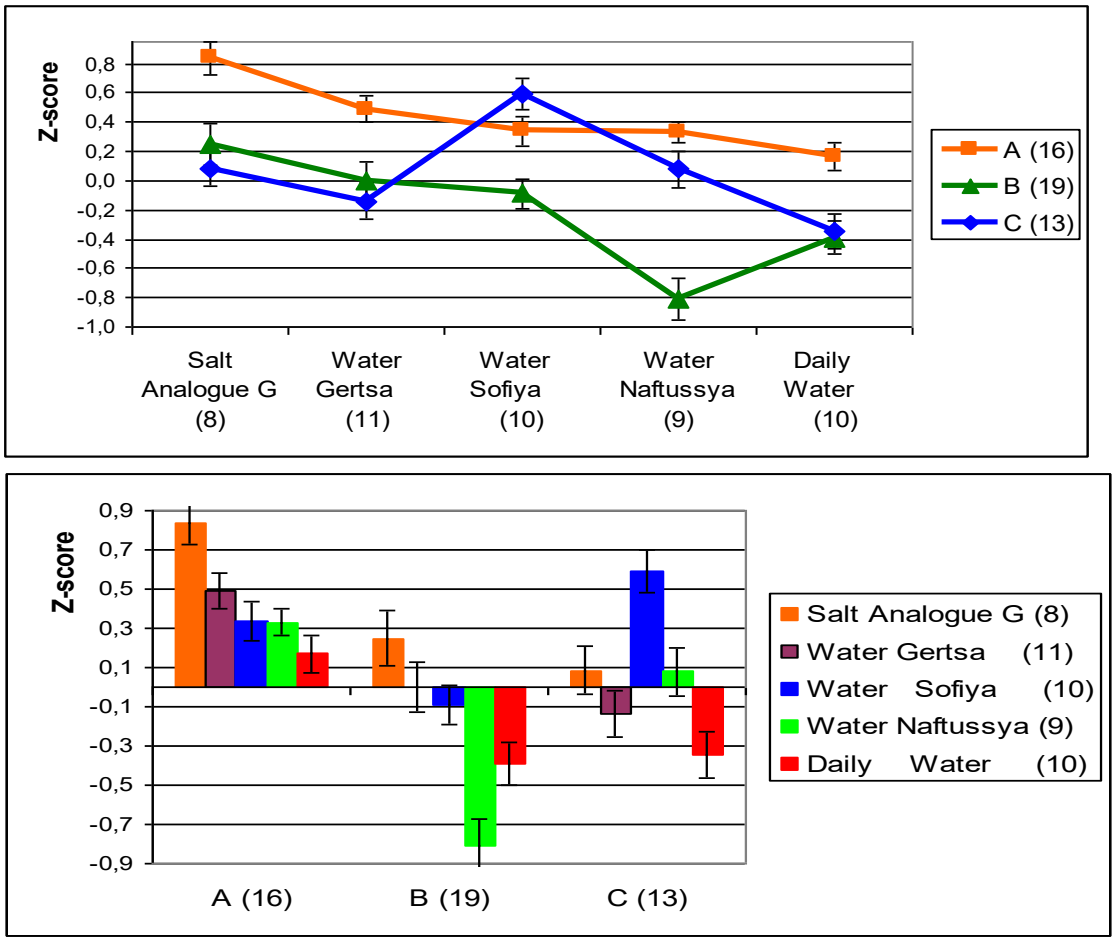

Fig. 4. Doubles and modulated superpatterns of reactions of metabolic parameters to water-salt loads

It can be seen that 16 parameters combined in superpattern A, the maximum deviates from the level of intact rats under the influence of the salt analogue of Gertsa water, a smaller, but

tangible effect is made by the Gertsa native water, even less effective waters Sofiya and Naftussya, instead of ordinary water is almost ineffective in relation to these metabolic parameters. It seems that the deviation from control of these parameters of metabolism is most influenced by the cations of Na^+ and Cl^- entering the body, while the simultaneous receipt of trace elements and organic carbon, and possibly of sulphate anion, weakens the effect of NaCl, whereas organic nitrogen enhances it.

The other 19 parameters combined into superpattern B, deviates to a maximum extent from the reference level after the use of Naftussya water, fresh water is less effective, whereas quasi-isotonic liquids are practically inactive for these parameters. Apparently, their deviation is caused by stress, which accompanies the process of water loading, as well as hypotonicity of water. Organic substances deepen the deviation, whereas the quasi-isotonicity of the waters reduces them.

The remaining 13 parameters of superpattern C in animals that use daily water, deviates from intact control to the same extent as in the previous superpattern, which, apparently, is also due to the stressful effects of the load course. Both Naftussya and Gertsa water and its salt analogue prevent the stress deviations of these parameters. Instead, by consumption of Sofiya water stresses deviations of these parameters is reversed, which is apparently due to the presence of its composition sulphate anion and organic nitrogen, whose content in other liquids is negligible.

Another approach to detecting the features of metabolic reactions to different water-salt loads is a discriminant analysis [10]. The program included 33 variables in the model (among them 8 refer to **plasma/erythrocytes electrolytes**, 7 to **electrolytes of urine**, to other metabolic parameters of **plasma** 5 and **urine** 9, separately allocated 4 **integral** parameters). Instead, other variables were out of the model (Tables 5 and 6).

Table 5. Discriminant Function Analysis Summary
Step 33, N of **Variables currently** in the model: 33; Grouping: 6 groups
Wilks' Lambda: 0,0004; approx. $F_{(165)}=2,40$; $p<10^{-6}$

Variables currently in the model	Parameters of Wilks' Statistics				
	Wilks' Λ •10^{-3}	Partial Λ	F-remove	p-level	Tolerancy
Calcium Plasma	,56	,756	1,29	,308	,101
Magnesium Excretion	1,18	,359	7,13	10^{-3}	,063
Sodium Excretion	,59	,721	1,55	,219	,026
Potassium Plasma	,70	,608	2,58	,059	,187
Glucose Plasma	,68	,621	2,44	,070	,248
Calcium Urine	,69	,613	2,53	,063	,043
Creatinine Urine	,94	,450	4,89	,004	,016
Phosphate Plasma	,92	,462	4,66	,006	,063
Urea Excretions	,60	,704	1,68	,184	,031
Middle Mass Molecules Urine	,64	,666	2,01	,122	,317
Glomerulary Filtration	,82	,518	3,72	,015	,065
Malonic Dialdehyde Plasma	,78	,544	3,36	,023	,173
Malonic Dialdehyde Urine	1,16	,366	6,92	,001	,073
Diene conjugates Urine	1,23	,345	7,58	10^{-3}	,094
Phosphate Urine	,70	,607	2,59	,058	,024
Potassium Erythrocytes	,75	,565	3,08	,032	,204
Canalicular Reabsorbtion	,86	,492	4,12	,010	,004
Creatinine Plasma	,95	,448	4,94	,004	,003
Chloride Excretion	,74	,570	3,01	,035	,018
Magnesium Plasma	,80	,527	3,58	,018	,062
Osmolarity Urine	,67	,633	2,32	,081	,046
Urea Plasma	1,19	,355	7,26	10^{-3}	,010
Chloride Plasma	,66	,646	2,19	,096	,006
Cholesterol Plasma	,84	,507	3,89	,013	,170
Amylase Urine	,84	,503	3,95	,012	,093
Uric Acid Urine	,55	,763	1,24	,327	,049
Katalase Urine	,77	,550	3,27	,026	,118
Sodium Plasma	,67	,636	2,29	,085	,008
Sodium Erythrocytes	,56	,760	1,26	,318	,146
Phosphates Excretion	,65	,652	2,14	,103	,004
Diurese	,59	,717	1,58	,212	,005
Calcium Excretion	,60	,710	1,64	,196	,018
Superoxide Dismutase Urine	,54	,785	1,09	,394	,256

Variables currently not in the model (df for all F-tests: 5,19)	Parameters of Wilks' Statistics				
	Wilks'Λ •10^{-3}	Partial Λ	F to enter	p-level	Tolerancy
Creatinine Excretion	,37	,868	,58	,716	,011
Sodium Urine	,41	,969	,12	,986	,038
Chloride Urine	,39	,913	,36	,868	,019
Potassium Excretion	,39	,922	,32	,894	,037
Urea Excretion	,39	,913	,36	,868	,053
Potassium Urine	,41	,977	,09	,993	,073
Magnesium Urine	,40	,949	,20	,957	,055
Bilirubine Plasma	,35	,830	,78	,579	,254
Amylase Plasma	,39	,912	,37	,864	,232
Urea Urine	,37	,885	,49	,778	,103
Uric Acid Plasma	,40	,949	,20	,957	,282
Superoxide Dismutase Plasma	,35	,824	,81	,554	,173
Middle Mass Molecules Plasma	,40	,950	,20	,958	,251
Katalase Plasma	,39	,913	,36	,868	,068
Diene conjugates Plasma	,36	,840	,72	,614	,085

Table 6. Summary of Stepwise Analysis

Variables currently in the model	F to enter	p-level	Λ	F-value	p-level
Calcium Plasma	5,5	,0004	,656	5,45	10^{-3}
Magnesium Excretion	3,4	,009	,491	4,36	10^{-4}
Sodium Excretion	3,2	,014	,372	3,98	10^{-5}
Potassium Plasma	3,0	,018	,284	3,78	10^{-5}
Glukose Plasma	2,4	,048	,226	3,54	10^{-6}
Calcium Urine	2,5	,042	,178	3,41	10^{-6}
Creatinine Urine	2,2	,066	,143	3,28	10^{-6}
Phosphate Plasma	2,7	,033	,111	3,27	10^{-6}
Urea Excretion	2,4	,053	,087	3,23	10^{-6}
Middle Mass Molecules Urine	1,8	,134	,072	3,12	10^{-6}
Glomerulary Filtration	1,8	,141	,059	3,02	10^{-6}
Malonic Dialdehyde Plasma	2,1	,080	,047	3,00	10^{-6}
Malonic Dialdehyde Urine	1,3	,271	,040	2,89	10^{-6}
Diene conjugates Urine	1,9	,116	,032	2,86	10^{-6}
Phosphate Urine	1,5	,213	,027	2,79	10^{-6}
Potassium Erythrocytes	1,8	,146	,022	2,76	10^{-6}
Canalicular Reabsorbtion	1,6	,179	,018	2,73	10^{-6}
Creatinine Plasma	1,5	,211	,015	2,68	10^{-6}
Chloride Excretion	1,9	,126	,012	2,69	10^{-6}
Magnesium Plasma	1,7	,168	,009	2,67	10^{-6}
Osmolarity Urine	1,8	,137	,007	2,68	10^{-6}
Urea Plasma	1,3	,299	,006	2,63	10^{-6}
Chloride Plasma	1,3	,301	,005	2,59	10^{-6}
Cholesterol Plasma	1,2	,324	,004	2,54	10^{-6}
Amylase Urine	2,0	,114	,003	2,58	10^{-6}
Uric Acid Urine	1,5	,230	,002	2,57	10^{-6}
Katalase Urine	1,3	,295	,002	2,54	10^{-6}
Sodium Plasma	1,4	,256	,001	2,52	10^{-6}
Sodium Erythrocytes	1,3	,310	,001	2,50	10^{-6}
Phosphates Excretion	1,3	,288	,001	2,48	10^{-6}
Diurese	1,4	,257	,001	2,47	10^{-6}
Calcium Excretion	1,1	,384	,001	2,44	10^{-5}
Superoxide Dismutase Urine	1,1	,394	,000	2,40	10^{-5}

The dividing information contained in 33 variables is condensed in 5 canonical discriminant roots (Table 7). At the same time, the first root contains 37,5% of discriminative opportunities, the second is 27,5%, the third is 17,3%, the fourth is 11,6%, and the fifth only 6,1%, therefore, will continue to be ignored.

Table 7. Chi-Square Tests with Successive Roots Removed

Roots Removed	Eigen-value	Canoni-cal R	Wilks' Lambda	Chi-Sqr.	Degree freedom	p-level
0	8,04	,943	,0004	291	165	**10^{-6}**
1	5,90	,925	,0038	209	128	**10^{-5}**
2	3,71	,887	,0264	136	93	**,002**
3	2,48	,844	,1243	78	60	,058
4	1,31	,753	,4326	31	29	*,346*

Table 8 shows standardized (normalized) coefficients for discriminant variables, while Table 9 shows non-standardized (raw) coefficients and constants for discriminant variables.

Table 8. Standardized Coefficients for Canonical Variables

Variables currently in the model	Root 1	Root 2	Root 3	Root 4	Root 5
Calcium Plasma	,514	-,017	,948	1,432	,108
Magnesium Excretion	-1,612	-2,624	-1,514	-,307	-,162
Sodium Excretion	,081	,215	2,618	2,728	,178
Potassium Plasma	,781	-,855	-,509	,697	,820
Glucose Plasma	-,697	1,021	,486	-,073	-,154
Calcium Urine	-,113	-,500	3,236	,676	-,572
Creatinine Urine	-3,706	-,692	-4,852	,438	2,428
Phosphate Plasma	,907	2,799	1,107	,438	-,009
Urea Excretion	1,894	2,329	1,016	-,614	,974
Middle Mass Molecules Urine	-,413	,099	,012	-1,119	-,050
Glomerulary Filtration	-1,062	-,914	1,307	2,341	,859
Malonic Dialdehyde Plasma	,669	-1,431	,731	,016	,326
Malonic Dialdehyde Urine	2,825	-,328	-1,158	,557	-,645
Diene conjugates Urine	-2,501	1,029	,240	-,549	,596
Phosphate Urine	1,784	1,438	-3,773	-,816	,805
Potassium Erythrocytes	-,874	,656	,983	,141	,732
Canalicular Reabsorbtion	10,26	-1,391	4,265	-4,353	-6,035
Creatinine Plasma	13,14	-1,750	-,027	-3,437	-5,909
Chloride Excretion	-4,212	-1,244	-1,384	-2,562	1,232
Magnesium Plasma	-2,589	-,774	1,081	,138	,682
Osmolarity Urine	2,038	1,368	,016	,360	-2,143
Urea Plasma	-7,435	,817	3,484	2,112	2,790
Chloride Plasma	4,807	5,889	-2,173	-2,590	-1,846
Cholesterol Plasma	1,403	-,098	-,990	-,542	-,519
Amylase Urine	-1,483	-,173	2,019	,149	-,476
Uric Acid Urine	-1,849	-1,080	-,289	,683	-,785
Katalase Urine	-1,724	-,379	,564	,785	,778
Sodium Plasma	-4,214	-4,762	2,782	2,160	1,724
Sodium Erythrocytes	,917	-,224	,163	-,755	-,864
Phosphates Excretion	1,848	-8,133	6,753	,069	-2,558
Diurese	-,736	7,108	-4,596	-,522	-,677
Calcium Excretion	,490	,939	-4,294	-,364	,784
Superoxide Dismutase Urine	,607	,204	-,675	-,071	,446
Discriminant Properties (%)	**37,5**	**27,5**	**17,3**	**11,6**	**6,1**

Table 9. Raw Coefficients and Constants for Canonical Variables

Variables currently in the model	Root 1	Root 2	Root 3	Root 4	Root 5
Calcium Plasma	,663	-,022	1,222	1,846	,1398
Magnesium Excretion	-,636	-1,035	-,597	-,121	-,064
Sodium Excretion	,0005	,0013	,0160	,0166	,0011
Potassium Plasma	1,071	-1,171	-,697	,956	1,124
Glucose Plasma	-,901	1,319	,628	-,095	-,199
Calcium Urine	-,137	-,6025	3,897	,814	-,689
Creatinine Urine	-2,204	-,411	-2,885	,260	1,444
Phosphate Plasma	1,791	5,525	2,185	,865	-,018
Urea Excretion	,586	,721	,314	-,190	,301
Middle Mass Molecules Urine	-,009	,002	,003	-,026	-,001
Glomerulary Filtration	-,0131	-,0113	,0161	,0289	,0106
Malonic Dialdehyde Plasma	,0236	-,0506	,0258	,0006	,0115
Malonic Dialdehyde Urine	,0909	-,0105	-,0372	,0179	-,0208
Diene conjugates Urine	-5,553	2,286	,532	-1,219	1,323
Phosphate Urine	,193	,155	-,407	-,088	,087
Potassium Erythrocytes	-,139	,104	,157	,022	,116
Canalicular Reabsorbtion	13,99	-1,896	5,814	-5,934	-8,227
Creatinine Plasma	,393	-,052	-,008	-,103	-,177
Chloride Excretion	-,0332	-,0098	-,0109	-,0202	,0097
Magnesium Plasma	-4,770	-1,426	1,992	,253	1,256
Osmolarity Urine	,0117	,0078	,0001	,0021	-,0123
Urea Plasma	-2,400	,264	1,125	,682	,901
Chloride Plasma	,760	,932	-,344	-,410	-,292
Cholesterol Plasma	3,263	-,229	-2,302	-1,260	-1,206
Amylase Urine	-,0390	-,0046	,053	,0039	-,0125
Uric Acid Urine	-1,019	-,595	-,159	,376	-,433
Katalase Urine	-39,88	-,009	,013	,018	,018
Sodium Plasma	-,788	-,890	,520	,404	,322
Sodium Erythrocytes	,191	-,047	,034	-,157	-,180
Phosphates Excretion	,036	-,157	,1308	,0013	-,0495
Diurese	-,988	9,544	-6,171	-,701	-,909
Calcium Excretion	,210	,402	-1,837	-,156	,335
Superoxide Dismutase Urine	,0714	,0240	-,0793	-,0084	,0525
Constants	**-1342**	**198,7**	**-605,7**	**570,7**	**786,6**

The calculation of the discriminant root values for each animal as the sum of the products of raw coefficients to the individual values of discriminant variables together with the constant enables the visualization of each rat in the information space of the roots.

On the plane of the first two roots, there is a clear distinction between clusters of intact rats and those subjected to loading by the salt analogue of water and Naftussya water. The less clearly separated cluster of animals loaded with native Gertsa water, instead, the other two clusters overlapped (Figures 5 and 6).

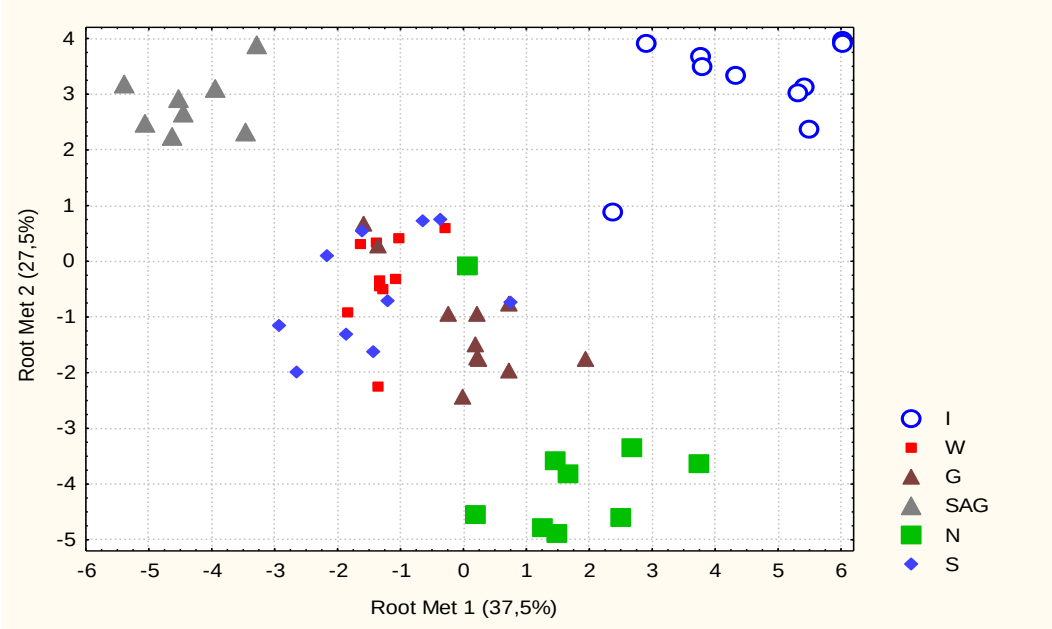

Fig. 5. Individual values of the first and second roots of the parameters of metabolism in intact rats (I) and loaded with Daily water (W), waters Naftussya (N), Sofiya (S), Gertsa (G) and its artificial salt analogue (SAG)

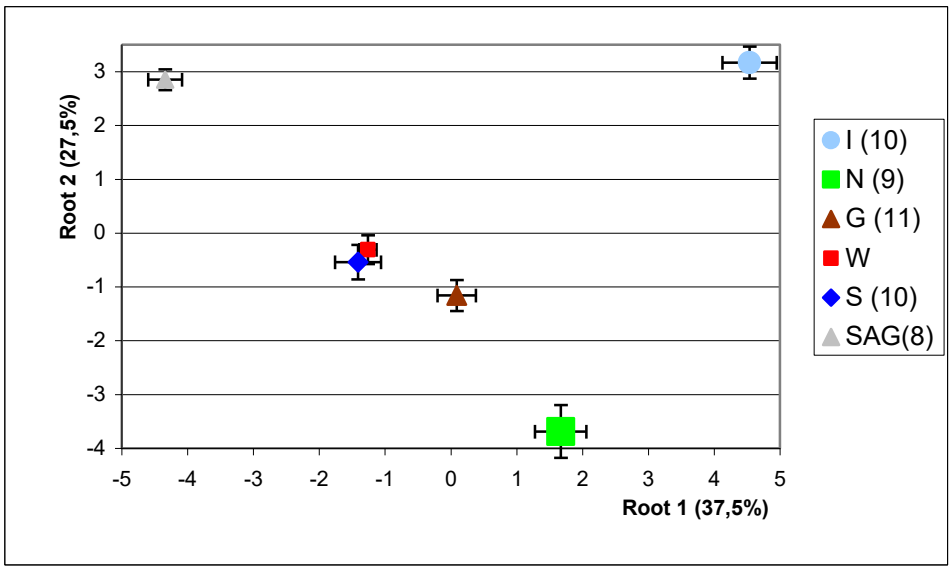

Fig. 6. Means of the first and second roots of the parameters of metabolism in intact rats (I) and loaded with Daily water (W), waters Naftussya (N), Sofiya (S), Gertsa (G) and its artificial salt analogue (SAG)

However, the clusters of rats loaded with Sofiya water and tap water show themselves to be delimited on the plane of the first and third roots (Figures 7 and 8). In this case, takes place the interpenetration of the three members of clusters W and G.

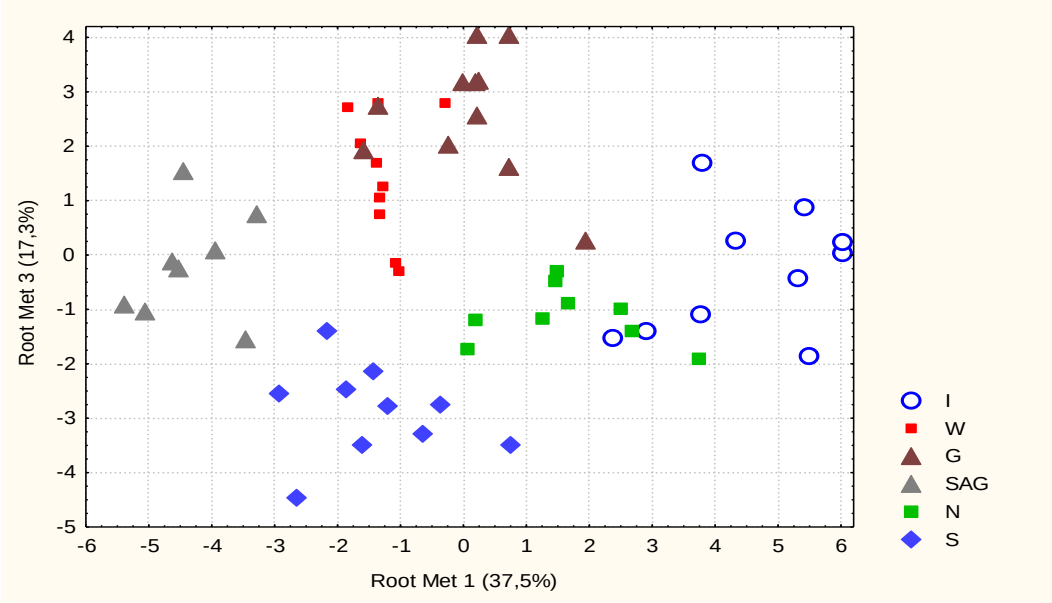

Fig. 7. Individual values of the first and third roots of the parameters of metabolism in intact rats (I) and loaded with Daily water (W), waters Naftussya (N), Sofiya (S), Gertsa (G) and its artificial salt analogue (SAG)

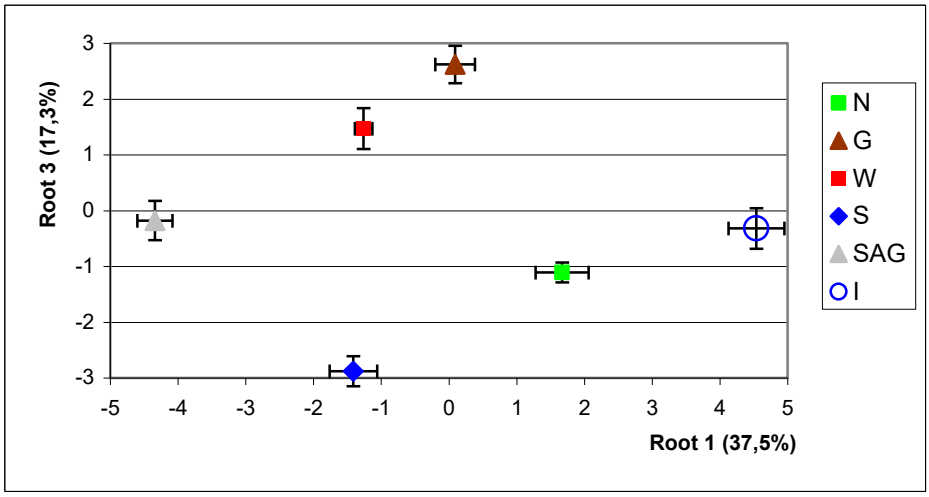

Fig. 8. Means of the first and third roots of the parameters of metabolism in intact rats (I) and loaded with Daily water (W), waters Naftussya (N), Sofiya (S), Gertsa (G) and its artificial salt analogue (SAG)

However, on the plane of the first and fourth roots, and these two clusters are clearly delineated (Figures 9 and 10).

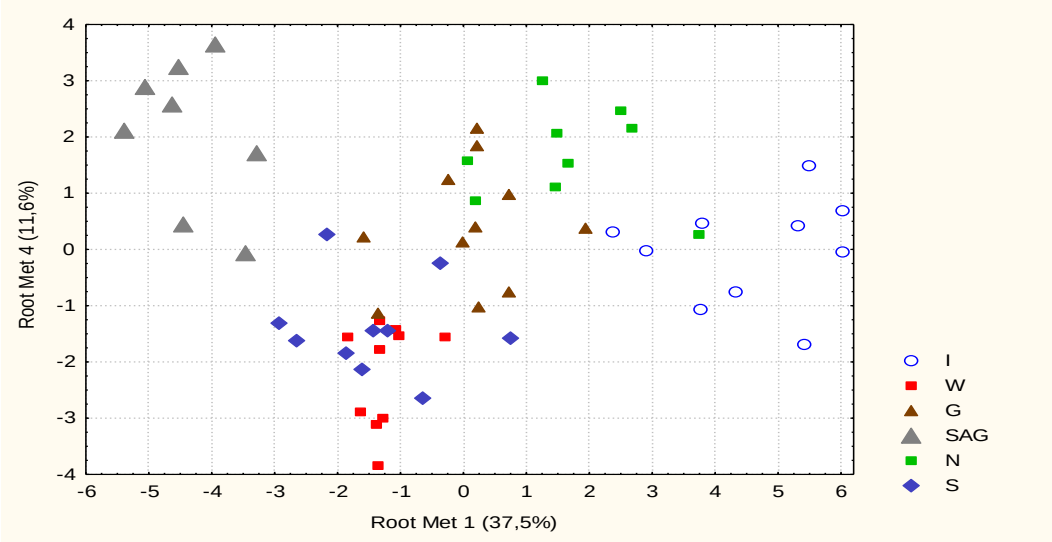

Fig. 9. Individual values of the first and fourth roots of the parameters of metabolism in intact rats (I) and loaded with Daily water (W), waters Naftussya (N), Sofiya (S), Gertsa (G) and its artificial salt analogue (SAG)

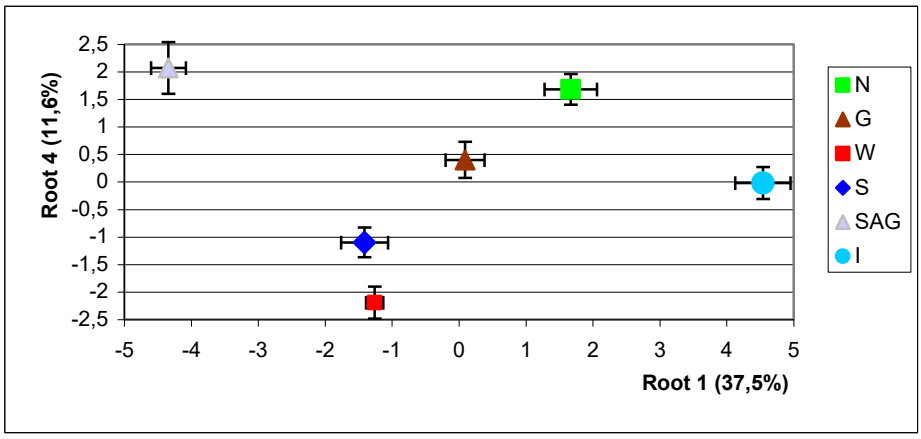

Fig. 10. Means of the first and fourth roots of the parameters of metabolism in intact rats (I) and loaded with Daily water (W), waters Naftussya (N), Sofiya (S), Gertsa (G) and its artificial salt analogue (SAG)

On the whole, in the information space of the four discriminating roots, all six clusters are clearly delineated, that is, they differ from each other by constellation of 33 parameters of metabolism. This distinction is documented by calculating the squared Mahalanobis distances between them (Table 10).

Table 10. Squared Mahalanobis Distances between groups (over diagonal), F-values (df=33) and p-levels (under diagonal)

Groups	I (10)	W (10)	G (11)	SAG (8)	N (9)	S (10)
Intact rats (I)	**0,0**	61,9	55,7	93,2	66,6	66,0
Daily Water (W)	**3,25** **,004**	**0,0**	21,4	46,2	46,7	29,3
Water Gertsa (G)	**3,07** **,005**	**1,18** **,355**	**0,0**	55,9	34,1	40,5
Salt Analogue G	**4,28** **,001**	**2,12** **,040**	**2,68** **,012**	**0,0**	89,5	46,7
Water Naftussya (N)	**3,29** **,003**	**2,30** **,026**	**1,77** **,091**	**3,90** **,001**	**0,0**	40,8
Water Sofiya (S)	**3,46** **,002**	**1,53** **,158**	**2,24** **,031**	**2,14** **,038**	**2,01** **,051**	**0,0**

Now let's return to a more detailed analysis of the Figures 5-10.

The polar localization along the axis of the first root of clusters of intact animals and loaded with salt analogues of Gertsa water reflects the maximum differences between them for the 8 parameters that correlate with this root **directly** or **inversely** (Table 10). At the same time, differences in these parameters between the other clusters are less clear (Figures 5 and 6).

The localization of the cluster of rats drinking Naftussya water along the axis of the second root in its lower zone reflects the minimum values of parameters that correlate with this root **directly** and the maximum values of the parameters that correlate with it **inversely**.

The localization of the cluster of rats fed with Sofiya water along the third root axis in its lower zone reflects the maximum values of parameters that correlate with this root **inversely** and the minimum values of parameters that correlate with it **directly** (Figures 7 and 8).

Finally, along the axis of the fourth root, the cluster of the rats receiving water from the tap is the lowest, reflecting the minimum level of calcium in them and the maximum level of magnesium, as well as the activity of superoxide dismutase and amylase urine.

Table 10. Factor Structure Matrix (Correlations Variables-Canonical Roots) and Means of Roots and Variables

	Root 1	Root 2	Root 3	Root 4	Salt A G	Sofi-ya	Daily Water	Ger-tsa	Naf-tussya	In-tact
Root 1 (37,5%)					**-4,34**	-1,41	-1,26	0,09	1,67	**4,54**
Glucose Plasma	**-,111**	-,002	,002	,005	**5,76**	5,31	5,61	5,15	5,32	**4,95**
Glomerul Filtratio	**-,110**	,033	,032	,193	**194**	112	86,5	142	109	**85,9**
Diurese	**-,098**	,048	,002	,189	**2,37**	1,53	1,44	1,66	1,65	**1,44**
Katalase Urine	**-,088**	-,015	,032	,053	**163**	136	151	141	145	**123**
Phospates Ex	**-,060**	,030	,029	,147	**137**	92	93	108	104	**91**
K Plasma	**,098**	,098	,024	,112	3,82	3,12	3,71	3,35	3,86	**4,23**
MMM Urine	**,067**	,022	,054	-,118	**147**	159	181	165	159	**182**
Phospates Urine	**,055**	-,028	,023	-,037	**58,9**	61,3	63,5	62,6	63,8	**63,9**
Root 2 (27,5%)					2,85	-0,54	-0,31	-1,16	**-3,69**	3,17
Diene Conj Urine	-,078	**,163**	-,066	,007	2,14	1,90	1,70	1,66	**1,45**	1,86
Chloride Ex	-,090	**,102**	,010	,057	244	195	102	203	**66**	144
K Erythrocytes	-,067	**,095**	-,044	-,021	90,1	88,5	86,9	85,8	**83,9**	87,0
Na Ex	-,088	**,087**	,039	,106	282	175	89	225	**66**	135
Osmolarity Urine	-,031	**,087**	,023	-,002	581	598	464	623	**411**	559
Na Erythrocytes	-,080	**,078**	,066	,006	25,5	21,8	23,7	22,7	**20,6**	22,0
Canalic Reabsorp	-,027	**,022**	,028	-,031	98,8	98,9	98,7	99,0	**98,5**	98,7
Ca Urine	,058	**-,150**	-,009	,112	1,93	2,07	2,15	2,32	**3,05**	2,10
Urea Plasma	-,005	**-,112**	-,076	-,044	7,44	9,29	8,92	7,85	**10,03**	7,42
Creatininemia	-,005	**-,088**	-,106	-,037	73	90	86	68	**98**	73
Ca Ex	-,032	**-,062**	,033	,179	4,50	3,09	3,08	4,25	**4,76**	2,90
Cholesterolemia	,023	**-,041**	-,037	-,034	1,46	1,62	1,60	1,53	**1,67**	1,57
Root 3 (17,3%)					-0,18	**-2,88**	1,47	2,62	-1,11	-0,32
Mg Ex	-,087	-,004	**-,268**	,129	5,85	**5,98**	2,65	2,51	5,07	3,30
Phosphatemia	,005	,039	**-,155**	-,072	0,92	**1,22**	0,87	0,72	0,88	1,04
Creatinine Urine	-,061	-,055	**-,107**	-,078	7,01	**8,12**	7,15	6,83	7,16	6,41
MDA Urine	,027	-,007	**-,080**	-,013	81	**102**	77	91	87	92
Uric Acid Urine	,030	-,009	**,198**	-,104	2,91	**2,56**	4,70	4,23	3,18	3,68
MDA Plasma	,005	-,101	**,172**	-,064	62	**57**	91	81	80	63
Uric Acid Ex	-,018	,050	**,134**	,020	6,5	**3,8**	6,7	6,0	4,9	5,7
Na Plasma	,012	-,039	**,080**	-,060	127,8	**127,0**	131,8	128,6	129,9	128,6
Cl Plasma	,023	,024	**,062**	-,004	92,9	**89,7**	95,0	91,5	93,2	93,8
Root 4 (11,6%)					2,07	-1,40	**-2,19**	0,40	1,68	-0,02
Ca Plasma	,044	,219	-,132	**,250**	3,36	2,57	**1,88**	2,32	2,44	3,35
Amylase Urine	,040	-,084	,031	**-,101**	181	210	212	215	210	202
SOD Urine	-,004	,012	-,024	**-,097**	59,9	62,6	**62,7**	59,8	59,6	61,3
Mg Plasma	,011	-,003	-,002	**-,065**	0,79	0,80	**1,05**	0,70	0,90	0,88

The application of the classifying functions (Table 11) enables the retrospective identification of the five clusters to be unmistakable, and the latter with a single error (Table 12).

Table 11. Coefficients and Constants for Classification Functions

Variables currently in the model	I	W	G	SAG	N	S
Calcium Plasma, mM/L	3219	3214	3221	3218	3220	3210
Magnesium Excretion, µM/24h•100 g Body Mass	-1103,5	-1097,1	-1097,9	-1097,9	-1094,4	-1094,1
Sodium Excretion, µM/24h•100 g Body Mass	10,1	10,1	10,2	10,1	10,1	10,0
Potassium Plasma, mM/L	927,8	923,9	924,7	921,0	936,0	924,9
Glukose Plasma, mM/L	-892,6	-890,9	-892,2	-885,2	-899,9	-893,3
Calcium Urine, mM/L	4466,2	4473,4	4482,3	4469,6	4468,4	4459,0
Creatinine Urine, mM/L	-9227,6	-9217,2	-9226,7	-9207,3	-9214,4	-9207,7
Phosphate Plasma, mM/L	218,2	190,6	193,1	202,6	174,8	180,3
Urea Excretion, µM/24h•100 g Body Mass	476,8	472,2	471,4	471,1	469,8	469,7
Middle Mass Molecules Urine, units	4,648	4,750	4,672	4,677	4,614	4,732
Glomerulary Filtration, µL/min•100 g Body Mass	-42,8	-42,7	-42,7	-42,6	-42,7	-42,8
Malonic Dialdehyde Plasma, µM/L	68,3	68,4	68,4	68,1	68,5	68,2
Malonic Dialdehyde Urine, µM/L	105,3	104,7	104,8	104,5	105,1	104,9
Diene conjugates Urine, E^{232}/mL	-8622,4	-8592,8	-8608,7	-8575,9	-8623,5	-8599,2
Phosphate Urine, mM/L	29,6	27,5	26,7	27,6	28,2	28,9
Potassium Erythrocytes, mM/L	-299,7	-298,8	-299,2	-298,4	-300,0	-299,8
Canalicular Reabsorbtion, %	51871	51809	51845	51733	51822	51799
Creatinine Plasma, µM/L	1150	1148	1149	1147	1149	1149
Chloride Excretion, µM/24h•100 g Body Mass	-47,1	-46,9	-47,0	-46,9	-47,0	-46,9
Magnesium Plasma, mM/L	-4619,4	-4582,0	-4588,0	-4575,3	-4595,9	-4592,7
Osmolarity Urine, mOsm/L	16,4	16,3	16,3	16,3	16,3	16,3
Urea Plasma, mM/L	-5191,3	-5176,5	-5179,6	-5168,1	-5185,1	-5182,9
Chloride Plasma, mM/L	149,9	142,2	141,8	141,9	140,7	143,7
Cholesterol Plasma, mM/L	5832,9	5811,7	5813,9	5800,6	5823,7	5823,4
Amylase Urine, mg/h•mL	-11,7	-11,4	-11,3	-11,3	-11,6	-11,5
Uric Acid Urine, mM/L	-1139,1	-1132,8	-1131,7	-1129,3	-1131,8	-1130,5
Katalase Urine, nM/h•mL	-56,48	-56,21	-56,20	-56,07	-56,26	-56,29
Sodium Plasma, mM/L	-29,8	-21,7	-21,3	-21,5	-20,9	-24,1
Sodium Erythrocytes, mM/L	707,3	706,5	707,0	705,3	706,6	706,7
Phosphates Excretion, µM/24h•100 g Body Mass	183,5	184,0	184,5	183,2	184,3	183,6
Diurese, mL/24h•100 g Body Mass	-1146,2	-1184,5	-1200,2	-1143,2	-1206,0	-1157,9
Calcium Excretion, µM/24h•100 g Body Mass	-2647,8	-2652,9	-2656,5	-2650,2	-2649,7	-2646,0
Superoxide Dismutase Urine, units/mL	-59,9	-60,5	-60,6	-60,6	-60,2	-60,3
Constants •10^3	-2560,2	-2554,4	-2557,9	-2547,0	-2555,6	-2553,1

Table 12. Classification Matrix
Rows: Observed classifications; Columns: Predicted classifications

Groups	Percent correct	I p=,172	W p=,172	G p=,190	SAG p=,138	N p=,155	S p=,172
I	100	**10**	0	0	0	0	0
W	100	0	**10**	0	0	0	0
G	90,9	0	0	**10**	0	**1**	0
SAG	100	0	0	0	**8**	0	0
N	100	0	0	0	0	**9**	0
S	100	0	0	0	0	0	**10**
Total	98,3	10	10	10	8	10	10

Consequently, through the formation of patterns, as well as discriminant analysis, we were able to identify those metabolic parameters whose changes are specific in response to the loading of water-salt solutions of different composition. The specificity of the reactions is due to the content in solutions NaCl, SO_4^{2-}, as well as organic carbon and nitrogen.

CONFORMITY TO ETHICAL STANDARDS

Experiments on animals have been carried out in accordance with the provisions of the Helsinki Declaration of 1975, revised and supplemented in 2002 by the Directives of the National Committees for Ethics in Scientific Research.

The conduct of experiments was approved by the Ethics Committee of the Horbachevskyi Ternopil' State Medical University. The modern rules for the maintenance and use of laboratory animals complying with the principles of the European Convention for the Protection of Vertebrate Animals used for scientific experiments and needs are observed (Strasbourg, 1985).

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