

## Corrective influence 2.5% suspension of glauconitic clay on the structural and metabolic manifestations of stress-induced endogenous intoxication

B.A. Nasibullin, S.G. Gushcha, O.Ya. Oleshko, A.V. Zmiyevskyy,  
I.V. Savitskyi

*State enterprise "The Ukrainian research institute of medical rehabilitation and balneology of Ministry of Health of Ukraine", Odessa*

### Abstract

Authors of 31 white male rats Wistar outbred breeding evaluated the effect of the internal receiving 2.5% glauconitic clay slurry on the state of detoxification mechanisms. The results showed that emotional stress, immobilization with weights situational causes endogenous intoxication, due to inactivation of the detoxification function of the liver caused by the imbalance of power supply processes of life and the reduction of renal excretory function. Internal use of 2.5% suspension of glauconitic clay improves the detoxification function of the liver in animals by stress caused by endogenous intoxication due to the recovery of renal excretory function and a significant improvement in energy production.

**Keywords:** endogenous intoxication, immobilization-emotional stress, ATPase; detoxification, renal excretory function.

### Introduction

The peculiarity of the present life of humanity is constant and very strong impact on a person of extreme physical external factors (heat, cold, vibration, injuries, etc.) and mental (danger, conflict) character. Under the influence of these factors in the body occur typical biochemical changes that combine concept - nonspecific adaptation syndrome (stress). The consequences of the emergence and development of the state of stress shown catfish just ahead of metabolic disorders [6, 7, 8, 9].

In our previous work, we found that the development immobilization emotional stress with situational complications (IESSC) accompanied by the development of endogenous intoxication [3].

Adjustments stress-induced disorders including endogenous intoxication at present carried out numerous pharmacological agents [2, 4, 5, 6]. However, features of modern socio-economic conditions needed to develop new approaches using natural medicinal factors.

Based on the aforementioned, the aim of our work was to evaluate the influence of glauconitic clay for internal use for signs of structural and functional changes in rats, which are due by stress-induced endogenous intoxication.

### Material and methods

Materials of this study were data obtained in the survey 31 white rats male Wistar outbred

breeding rats weighing 180-200 g according to work tasks ranked into three groups. The first group was seven intact rats and they used as a control. The second group was 12 rats, which within 30 days reproduced the state of stress-induced endogenous intoxication (SIEI). The third group was 12 rats, which against the backdrop of SIEI starting from 15 to 30 days of the experiment injected into the esophagus soft probe of olive glauconitic 2.5% suspension of clay in volume of 1 % of body weight of the rat. To create IESS animals for 30 days, every day for 3 hours placed in the cell-case 15x4x5 cm size, which provided soft immobilization animals. These cell-cases, in turn, placed in a box, where there was plenty of other animals and it is has caused emotional stress. Case complications reproduced chaotic upheavals diet, drinking, lighting duration, changing composition and number of animals in cages. The animals taken out of the experiment decapitation under light ether anesthesia. Each rat taken in 3.0 ml of blood for biochemical studies and extracted pieces of liver and kidneys for histological studies. Biochemical methods were tested AMW (average molecular weight), the content of total bilirubin and its fractions, urea and creatinine in plasma, activity of Na-K and Mg-Ca - ATP-ases in homogenate of liver tissue in rats. Liver detoxification function assessed by the results thiopental (hexenal) samples. Renal function as assessed by urine

formation function (glomerular filtration, tubular reabsorption, daily diuresis) and excretory function of excretion for creatinine and urea. According to the results of histological studies determined the structural changes in the liver and kidneys. Methods by which the aforementioned indicators defined answered "Manual methods of research natural and preformed remedies" [1].

## Results and discussion

Development SIEI accompanied by significant changes in liver detoxification function. Conducting thiopental tests established in these animals almost double increase in sleep time of drug, namely  $72,21 \pm 0,82$  min vs  $38,37 \pm 2,62$  min at the beginning of the experiment (table. 1). This accompanied by significant biochemical changes. Found a sharp increase of the average molecular weight.

Table 1. Metabolic changes in rats during development and under the influence SIEI internal use glauconitic clay

Indicators		First group control	Second group rats with SIEI 30 days	Third group rats with SIEI and glauconitic course 30 days
Thiopental sleep duration, min		38,37±2,65	72,21 ± 0,82*	—
Thiopental sleep duration, min		46,50±1,45	—	22,55±1,05**
AWM <sub>254</sub> , c. u.		0,34±0,02	0,57±0,01*	0,53±0,01**
AWM <sub>280</sub> , c. u.		0,22±0,01	0,32±0,01*	0,21±0,01
Bilirubin mmol / l	Total	5,79±0,81	7,95±0,23*	4,58±0,12**
	Direct	1,98±0,32	3,05±0,14*	1,53±0,09**
	Indirect	3,82±0,51	4,89±0,17*	3,05±0,17**
Urea, mmol/l		2,80±0,27	6,73±0,24*	5,37±0,32**
Creatinine, mmol/l		47,80±0,63	54,64 ± 0,58*	49,09 ± 1,08**
Na-K-ATP-ase, mg/P/g tissue		9,11±0,33	7,55±0,44*	8,90±0,41**
Ca-Mg-ATP-ase, mg/P/g tissue		6,40±0,62	2,88±0,13*	5,17±0,41**

Notes: 1. \* - difference in second group by the control,  $p < 0.05$ ;  
2. \*\* - difference in third group by the control,  $p < 0.05$ .

As regards the increase of both factions, AWM can assume that there is a metabolic lipid compounds and proteins. At the same time increased, the content of total bilirubin and its fractions in blood, but the changes not observed value factions. This suggests that reduced bile forming liver function, but a catastrophic depression detoxification function occurs.

The peculiarity of these changes may be associated with a reduction in energy processes of life. Such changes indicates decreased activity of ATP-ases value and violations of their activity (table 1). In addition, proof of intoxication is increasing endogenous growth urea and creatinine in blood plasma.

In the development of EISS subjected to changes and functional activity of the kidneys. Development SIEI accompanied by a sharp decrease in the volume of daily urine output, due

almost a double decrease in glomerular filtration rate (table 2). Even a significant inhibition of tubular reabsorption process does not affect the amount of daily urine output, and its value is one and a half times lower than the benchmarks. However, deteriorating and excretory function of the kidneys. Thus, by reducing glomerular filtration rate decreases daily excretion of creatinine and urea. It should note - changes in the output of renal function contribute to the accumulation of urea and creatinine in the blood and lead to further development disorders detoxification function of the liver.

Histological studies showed: the liver against the background of conservation and lobular structure of the orderly arrangement of hepatocytes in beams is a thickening of the membranes of these cells. The cytoplasm of hepatocytes with large indentations, slightly basophilic, the nucleus

edematous. Breasts removed in the cytoplasm to the cell periphery. In some hepatocytes observed vacuoles. Maybe talk about signs of degeneration of liver tissue. Kidney histological examination of changes in the structure or components of the nephron (kidney cells, and direct usual tubules, interstitial layers) were determined, i.e. preserving the structural and

functional organization of the kidneys in the dynamics of SIEI be looking to maintain its excretory function. In other words, after 30 days of SIEI kept the structural and functional organization of the kidneys, which is able to restore normal excretory renal function.

Table 2. Changes of kidney function in animals with SIEI and influenced internal use of glauconitic clay

Indicators	First group control	Second group rats with SIEI 30 days	Third group rats with SIEI and glauconitic course 30 days
Daily urine output, ml/dm <sup>2</sup>	1,11±0,09	0,67±0,01*	1,71±0,01**
Filtration rate, ml/(dm <sup>2</sup> ·min)	0,11±0,04	0,06±0,01*	0,15±0,01**
Tubular reabsorption, filtration rate, %	99,31±0,04	98,17±0,04*	99,22±0,32
The output of creatinine, mmol/l	0,011±0,001	0,006±0,001*	0,015±0,13**
The output of urea, mmol/l	0,50±0,03	0,24±0,13*	0,87±0,41**

Notes: 1. \* - difference in second group by the control, p <0.05;

2. \*\* - difference in third group by the control, p <0.05.

The use of 2.5% suspension of glauconitic clay SIEI rats produced a positive impact on research performance homeostasis. First, it should be noted improve liver detoxification function, confirmed thiopental data sample. Duration of sleep medication decreased from 46,50 ± 1,45 to 22,55 ± 1,05 minutes (table 2). Regarding the systemic manifestations of endogenous intoxication, their improvements were less certain. Content AWM<sub>280</sub> normal at the same time as the content AWM<sub>254</sub> remained elevated. There was a normalization of total bilirubin and its fractions, i.e. we can assume that the use of glauconitic clay normalizes the function of bile formation and bile forming in experimental animals. Since the activity and balance, the activity of ATP-ases returned to normal in these animals may believe that restoring normal energy supply due to the impact of glauconitic clay helps to normalize the basic functions of life in experimental animals. Along with the restoration activity of ATP-ases, creatinine level dropped almost to the level of the control data and contents of urea remained high. It is possible to assume that preference changes

catabolic protein compounds performed very intensively, so that conditions for the existence of endogenous intoxication still remain.

According to table 2, SIEI rats treated with glauconitic clay, defined increase in daily diuresis. This increase is due to a sharp increase in glomerular filtration. Level reabsorption thus returns to its values in intact animals. Withdrawal of creatinine and urea in these animals greatly enhanced. However, since the urea content in the blood is still high, it believed that the withdrawal of metabolites catabolism of nucleic compounds not leading value that causes partial preservation of endogenous intoxication.

Histological examination of the liver in rats treated with glauconitic clay against the backdrop of endogenous intoxication stress caused found that lobular structural and functional organization of liver tissue is preserved. In contrast to the comparison group, hepatocytes arranged in the beams at a considerable distance from the main vein. Vessels triade and the central vein moderate blood supply. Hepatocytes medium size, weakly

basophilic cytoplasm homogeneous color. Nuclei are small, moderately colored. There are dual hepatocytes. Between joist spaces with slits, Kuepfer cells look normal.

Kidney histological examination of visual changes (disturbances) of the structural organization of the nephron or its components not defined. Kidney cells located in the cerebral cortex evenly. Capillary balls round, Bauman's common space. Epithelium of waved tubular swollen, but less than in the comparison group preparations.

### Conclusions

Thus, the results of our studies show that the development stress induced endogenous intoxication accompanied by liver detoxification function, inhibition urinary creating and excretory renal function, due to the presence of signs of degeneration in the liver. Perhaps the development of atrophic changes due to oppression and imbalance of power processes of their activities. Glauconitic clay for internal use helps to restore, but not 100% of enzyme activity energy. Because the course of glauconitic in rats improves detoxification function of the liver, offset degenerative processes in it, reduced the intensity of endogenous signs of intoxication. The kidneys not only reduced, but also improve their urinary creating and excretory functions. There still not fully recovered only indexes content MSM254 and urea in blood; obviously, biological activity glauconitic clay does not provide full correction of disturbed development indicators caused SIEI. Therefore, we can assume appropriate for full rehabilitation application with other medicinal clay glauconitic natural remedies.

### Compliance with ethical standards

Experiments conducted on animals in accordance with Directive 2010/63 / EU of the European Parliament and of the Council on the protection of vertebrate animals used for scientific research (Official Journal L 276, 20.10. 2010 - P. 0033 - 0079). Experimenting approved by the Commission on Bioethics control State enterprise "The Ukrainian research institute of medical rehabilitation and balneology of Ministry of Health of Ukraine."

### References:

1. Aleksjejenko N.O., Pavlova O.S., Nasibullin B. A., Ruchkyna A.S. Manual methods of research and preformed natural remedies, natural health mineral waters and curative waters, drinks based on them; artificially mineralized water; peloids, brine, clay, waxes and preparations based thereon. Odessa: Socio-UNESCO. 2002. Part 3 - 114 p.
2. Egorkina S.B., Sorokin A.V., Minaeva E.V. The anti-inflammatory mechanism of DENS in a stress-induced immunodeficiency / Reflexology. 2006 (2):23 - 24.
3. Zolotareva T.A., Pavlova E.S., Nikipelova E.M. Prospects for the use of low-mineralized mineral water for the correction of stress-induced endogenous intoxication. Odessa: Polygraph. 2012. 120 p.
4. Klimenko Ju.A. Changes and correction of trace element homeostasis and prevention of complications in experimental peritonitis / Galician medicinal gazette. 2010. V. 17 (1):38 - 41.
5. Kudrin A.V., Skal'nij A.V., Zhavoronkov A.A. Immunopharmacology micronutrients. M.: KMK. 2006. 537 p.
6. Musimus S.G. Syndrome of endogenous intoxication in case of emergency. M.: Binom. 2008. 200 p.
7. Panin L.E. Biochemical mechanisms of stress. Novosibirsk: Nauka. 1983. 233 p.
1. Pshennikova M.G. The phenomenon of stress. Emotional stress and its role in pathology / Pathological physiology and experimental therapy. 2001 (1): 26 - 31.
2. Sudakov K.V. New aspects of the classical conception stress / Bulletin of experimental biology and medicine. 1997. V. 123 (2): 124 -130.