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CHARACTERISTICS OF SOME BIOLOGICAL MARKERS OF THE ANTIOXIDANT SYSTEM IN THE CHILDREN WITH VIRUS INFECTIOUS DIARRHOEA

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Background

A very important test of diarrhea diseases is a presence of violations of microbiota. Rotavirus is the most frequent cause of viral gastroenteritis worldwide. A research report has found that the number of died children due to the infection is approximately 6,00,000 around the world. In Ukraine on a **Rotavirus** infection are from 35 to 75 % cases of acute enterocolitis. Rotavirus infection (RVI) is the most frequenting of the difficult dehydrating diarrhea. In countries which develop, rotavirus cause by over 850 000 cases of death. In Ukraine on RI is from 35 to 75 % all of cases of acute gastroenteritis[1,2,3]. The virus generally affects the children who are in the age group of six months and two years. The infection can occur several times and with different symptoms. The infection can also affect the adults; however, the **Rotavirus symptoms** will be very tender. If the infection occurs several times in a patient, he/she can develop resistance power to the virus. The person, who gets the **Rotavirus infection**, usually suffers with the **Rotavirus symptoms** within two to three days. The illness that occurs through the infection results in fever, headaches, vomiting, nausea, pain in the abdomen and diarrhea. The diarrhea will be very watery and can occur with cramps in seven cycles a day. These Rotavirus symptoms stay for three days to ten days. If the patient gets the infec-

tion many times, he/she can have the resistance to it and if the infection occurs repeatedly, the symptoms will be less serious. However, several occurrence of the infection, can lead to dehydration because of the loss of water by diarrhea [4,5].

Aim

Analyses of bacteriological, microbiological, scatological and laboratorial change of faeces and state of antioxidant system in the children with virus infectious diarrhoea.

Material and methods

Our study included children with RVI, aged 12-36 month (1st group n=76 patients, 2nd group, n=72 patients, which used complex therapy with probiotic). The intestinal bacterial microbiota was examined from stool samples.

Results

The Rotavirus infection (RVI) patients have identified intestinal disbioses of different degree before the treatment (1 degree 50,28±1,94%, 2 degrees 20,37± 1,23 % in the 1st group and 42,37±2,16 and 11,52±1,94% in the 2nd group). The violation of level of population of anaerobes, in particular Lactobacillus and Bifidobacterium have leading role in forming of Disbioses. We presented clinical dates of the children with Rotavirus infection

Table 1

Clinical form of rotavirus infection

Parameters	1 group (n)	%	2 group (n)	%
Cattarh form	10	16,13 ±6,72	14	18,42±6,37
Gastrointestinal form:				
-gastritis	-	-	2	2,63
-enterocolitis	4	6,45		
-enteritis	-	-	2	2,63
-gastroenteritis	17	27,42± 5,87*	36	47,37±8,21*
-gastroenterocolitis	40	64,52 ±8,74	36	47,37±8,21

Note: * p<0,05, ** p<0,01

The most common was clinical form of rotavirus infection gastrointestinal by type of gastroenteritis (27,42±5,87 та 47,37±8,21) and gastroenterocolitis (64,52±8,74 та 47,37±8,21) in the two children groups. Clinical form of rotavirus infection is characterised by typical syndromes. Intoxicational syndrome in the case of rotavirus infection is one of the most common, usually it is characterised by nonspecific signs.

According to our data problems with appetite bad 95,16±2,75% and 96,05±2,25%, lack of strength, paleness of skin was in the case of 82,26±4,89% and 75,00±5,00%. The reaction of temperature was recorded in the majority of patients with rotavirus infection. Children in two groups had temperature 39 – 41 C. (48,39±6,40% to 38,16±5,61%).

Second most common syndrome is diarrhea, which was typical in the case of all patients of the second group.

Table 2

Characteristics of diarrhea syndrome

Parameters	1 group	2 group
Day when appeared	1,55	1,47
Duration	6,00 ±0,33**	4,63 ±0,18**
Number of defecations 1-5	32 children	56 children
Number of defecations 6-10	30 children	20 children

Note:* p<0,05, ** p <0,01

Diarrhea is recorded in the case of all children with rotavirus infection from the first hours of illness. The children with rotavirus infection had predominantly osmolarity type of diarrhea according to A.Parfenov, 2007, which is characterized with disorders with digestion and absorption, lack of normal contact with intestines. Properties of diarrhea syndrome were typical: defecations were fluid, yellow or greenish with badly digested food. In the case of children with basic curation with immunologic biomineral correction the duration of diarrhea was shorter (4,63 ±0,18 to 6,00 ±0,33, p<0,001).

The number of defecations in the case of mid-severe form was 1-5 times per day and night, in the case of severe form: 6-10 times per day and night. In the case of 41,23±4,12 % of children we recorded toxemia and dehydration. In all cases it was equal to the II degree and was isotonic. We must admit, that in the case of 30,49 ±5,08 % and 55,26±8,17% children the severeness of the syndrome was caused by atsetonemic syndrome.

Gastrointestinal disorders were also representative in the case of children with rotavirus infection.

Table 3

Gastrointestinal syndrome in the case of children with rotavirus infection

Parameters	1 group (quantity)	%	2 group (quantity)	%
Bad appetite	59	95,16±2,75	72	96,05±2,25
Stomachache	33	53,23±6,39	48	63,16±5,57
Flatulence	34	54,84±6,37	35	46,05±5,76
Vomiting: -1-5 times	41	66,13±6,06	50	65,79±5,48
-6-10 times	17	27,42±5,71	25	32,89±5,43
Diarrhea: -1-5 times	32	51,61±6,40	56	73,68±5,08
-6-10 times	29	46,77±6,39	20	26,32±5,08

Note:* p<0,05, ** p <0,01.



The signs of gastroenteritis are characterized with flatulence in the case of $54,84 \pm 6,37\%$ and $46,05 \pm 5,76\%$ in the groups. The pain is localized at paraumbilicalis area and diffusive: on all front side of the belly ($53,23 \pm 6,39\%$ and in the second group $63,16 \pm 5,57\%$). Vomiting is recorded in the case of ill children with rotavirus infection usually 1-5 times per day and night ($66,13 \pm 6,06\%$ and $66,13 \pm 6,06\%$). Number of defecations was 1-5 times per day and night and in the case of midsevere form was $51,61 \pm 6,40\%$ and $73,68 \pm 5,08\%$ whereas in the case of severe form: 6-10 times per day and night $46,77 \pm 6,39\%$ and $26,32 \pm 5,08\%$.

In many researches we can see the tendency to concentrate on the catarh, which is typical for 7-35% of ill with rotavirus gastroenteritis [1, 2, 5, 24]. Some authors claim, that this syndrome is caused by the activity virus in respiratory tract which is typical for rotavirus infection.

We characterized bacteriological, microbiological, scatological and laboratorial exploration of faeces. Newborn children have aseptic large intestine. During first few months of life there was appeared microorganisms. Normally localization of autochthonous species is

stable, every species takes its own place and is included in the system. The number of microbes depends not only on its nutrition, it is controlled with specific mechanisms. Normally, the majority of microorganisms in intestines localizes on the epithelium. Albumen antigens provide «sticking» or aggregation of bacteria and is controlled by transmissible plasmids (DNA multiplied regardless to chromosomatic DNA). The number of DNA structures, to which microorganisms can «stick» and synthesis of other albumens are regulated. Apart from this, if these structures deal with normal bacteria they enable pathological bacteria «stick» to enterocytes. The majority of pathological microorganisms start to proliferate and secrete its toxins only after «sticking» to the epithelium. One of the mechanisms of protection, of patients, who suffered from intestine infections is to prevent «sticking» of virus particle to the membrane of enterocytes. That's why impoverishment of all mechanisms of protection leads to the problems with ballance of saprophytic microorganisms and the risk of infection is higher (243,244,245).

In the case of rotavirus infection and other intestine infections we can record substantial problems with microbiocenosis of intestines.

Table 4

Analysis of disbacteriosis of excrements in the case of children with rotavirus infections

Parameters	1 group (n=30)		2 group (n=30)		P
		M±m		M±m	
Number of E. coli) 109-1010	15	$50,0 \pm 9,58$	15	$50,0 \pm 9,58$	
Number of E. coli) 107-108	6	$20,0 \pm 7,43$	12	$40,0 \pm 9,10$	<0,05
Number E. coli) 103-106	9	$30,00 \pm 8,51$	3	$10,00 \pm 5,57$	
Lactobacillus 107-108	15	$50,0 \pm 9,58$	3	$10,00 \pm 5,57$	<0,05
Lactobacillus 105-106	15	$50,0 \pm 9,58$	7	$23,33 \pm 7,97$	
Bifidum Bacterium 108-109	15	$50,0 \pm 9,58$	18	$60,0 \pm 10,04$	
Bifidum Bacterium 106-107	15	$50,00 \pm 9,58$	12	$40,0 \pm 9,10$	
E. coli with abnormal enzyme activities акт 104-105	9	$30,00 \pm 8,51$	-	-	
E. coli with abnormal enzyme activities 106-108	6	$20,0 \pm 7,43$	10	$33,33 \pm 8,80$	

Note: *p<0,05

As we can see, the data concerning microorganisms in intestines of children with rotavirus infection is mostly identical in the two groups, in particular Bifidum Bacterium (100%). In the case of first group we can see often occurred: E. coli with abnormal enzyme activities concor-

dantly (n=15, (50,00±9,58%) to n=10, (33,33±8,80%); Lactobacillus (n=30, 100% to n=10, (33,33±8,80%).

We diagnosed various degrees of disbiosis of intestines According to the results of the intestine microbiocenosis disbalance analysis, (table 5).

Table 5

Level of intestines disbiosis in the cases of children with rotavirus infection

Degree of disbiosis	Group 1 (n=30)		Group 2 (n=30)	
	Aprox.	%, M±m	Aprox.	%, M±m
Eubiosis	9	30,00±0,00	12	40,00±0,00
Disbiosis I degree.	15	50,00±0,00	12	40,00±0,00
Disbiosis II degree.	6	20,00±0,00	6	20,00±0,00

The results prove that eubiosis is typical for the children from the second group (n=12, (40,00±0,00) % to n=9, (30,00±0,00) % (p > 0,05)).

Disbiosis I degree is diagnosed in the case of 15 patients (50,00±0,00) % from the first group and 12 (40,00±0,00) % from the second group (p > 0,05).

Disbiosis II degree is diagnosed in the case of 6 patients (20,00±0,00)% (p > 0,05) in both groups.

Our analysis showed that in the case of rotavirus infection there is disbalance of microbiocenosis with microecological problems. The degrees of disbiosis vary.

Frequency of disbiosis of I-II degree in the groups statistically is equal.

Microscopic exploration of excrements in the case of children with rotavirus infection we analyzed according to syndromes. (table 6).

Table 6

Scatological syndromes of children with rotavirus infections

Elements	Scatology		Pancreatic insufficiency		Biliary excretion insufficiency		Enteral syndrome	
	1rp. M±m	2rp. M±m	1 group	2 group	1 group	2 group	1 group	2 group
Starch:: -extracell (+)	45 72,58±5,71	48 63,16±5,56	-	-	-	-	45	48
- extracell (++,+++)	8 12,90±4,29	9 11,84±3,73	-	-	-	-	8	9
Neutral fat	3 4,84	19 25,00±5,00	3	19	-	-	3	19
Fatty acids	-	4 5,26	-	-	-	4	-	4
Sweetheart	2 3,23	-	-	-	2	-	2	-
mucus (+)	47 75,81±5,48	52 68,42±5,37	-	-	-	-	-	-
mucus (++)	8 12,90±4,29	5 6,58±2,86	-	-	-	-	-	-
mucus (+++)	1 1,61	-	-	-	-	-	-	-
Muscle fiber modified (+ +, +++)	8 12,90 ±4,29	6 7,89±3,11	8	6	-	-	8	6
Muscle fiber unchanged (+)	10 16,13±4,71	24 31,58±5,37	10	24	-	-	10	24
Muscle fiber unchanged (+ +, +++)	9 14,52±4,51	11 14,47±4,06	9	11	-	-	9	11



Enteral syndrome is characterised by:

- presenting of creathorrea in the 27 children (43,94±4,49%) and in 41 children (55,94±4,06%) concordantly by groups;
- - steatorrea in the 3 children (4,84%) and 19 children (25,00±5,00%) concordantly, Sweetheart in the 2 children (3,23%);
- amilorrea - Starch extracell (+) in the 45 children (72,58±5,71%) and 48 children (63,16±5,56%) concordantly, Starch extracell (++,+++) in the 8 children (12,90±4,29%) and 9 children (11,84 ±3,73%) concordantly.

Pancreatic insufficiency is characterised by:

- including neutral fat (steatorrea) in the 3 children (4,84%) and 19 children (25,00±5,00% concordantly);
- Muscle fiber modified (creathorrea) in the 8 children (12,90±4,29%) and 6 children (7,89±3,11% concordantly).

Biliary excretion insufficiency — with fast motion of food in intestines there is big quantity of Fatty acids (steatorrea) y 4 children (5,26% 2nd group) and sweetheart in the 2 children (3,23% 1 group).

As we can see, the structure of scatological syndromes in the case of children with rotavirus infections is mostly similar usually it is characterized by enteral syndrome, in the groups with consequent tendency to decrease: pancreatic insufficiency and biliary excretion insufficiency.

So, scatological analyses showed the following changes in the groups: pathological changes, presence of Starch and Neutral fat, pH in large intestine was characterised by decrease in acid level. This data proves that children with rotavirus infection suffer from digestion disballance.

Instrumental explorations of abdomen organs presented the next dates. Ultrasonography is very informative in the case of children with rotavirus infections. Here is the data:

Table 7

Ultrasonography of digestive tract

Parameters		1 group (n = 62)		2 group (n = 76)		P
		Aprox	%, M±m	Aprox	%, M±m	
Liver size:	Norm	6	9,68±3,79	6	7,89±3,11	
	+0,5 см	12	19,35±5,06	8	10,53±3,54	
	+ 1 см	20	32,26±5,99	26	34,21±5,48	
	+1,5 см	10	16,13±4,71	16	21,05±4,71	
	+2 см	14	22,58±5,35	20	26,32±5,08	
echogenicity:	medium,	10	16,13±4,71	42	55,76±5,04	p< 0,05
	high,	46	74,19±5,60	18	23,68±4,91	p< 0,001
	low	6	9,68±3,79	16	21,05±4,71	
Gall blader size:	Normal	50	80,65±5,06	60	78,35±4,71	
	Extended	8	12,90±4,28	6	7,89±3,11	
	Reduced	4	6,45	10	13,16±3,90	
Gall bladeer from:	Regular	42	67,74±5,99	46	60,53±5,64	
	Irregular	20	32,26±5,99	30	39,47±5,64	
The level of congestive bile	visualized	16	25,81±5,60	6	7,89±3,11	p< 0,05
Walls	not thickened	60	96,77±2,26	76		



	sealed	2	3,23	-		
Pancreas:	Extended	44	75,81±5,48	64	84,21±4,21	
	Regular	16	25,81±5,60	12	15,79±4,21	
	Hard to estimate	2	3,23	6	7,89±3,11	
Structure	finely granular	46	74,19±5,60	56	73,68±5,08	
	coarse-grained	14	22,58±5,35	20	32,26±5,99	
echogenicity:	medium	26	41,94±6,32	28	36,84±5,57	
	high	20	32,26±5,99	32	42,11±5,70	
	low	14	22,58±5,35	16	21,05±4,71	
Spleen	Extended	7	11,29±4,05	2	2,63	
Flatulence		24	38,71±1,61	18	23,68±4,91	

During the analysis of Hepatobiliary system (64 children to 72) applying ultrasonography we recorded the following results.

Sonographic verified status liver parenchyma, gallbladder and bile ducts, the presence or absence of effects of vascular changes. The pattern of liver blood vessels was standard, course of vascular system in portal vein and hepatic vessels within the reference values. Intrahepatic bile duct visualized in all the children and were of normal shape. The extension of liver was different in the groups 56 children to 70 from the second group. Features echogenicity of the liver parenchyma as follows: in 46 (74,19 ± 5,60%) infants and 18 (23,68 ± 4,91%) children of the second

group. Irregular form of gall bladder according to ultrasonography is diagnosed in the case of 20 children of the first group (32,26±5,99%) and 30 of the second (39,47±5,64%). Pancreas extension was also typical for both groups: 44 children (75,81±5,48%) and 64 (84,21±4,21%). Echogenicity of pancreas was identified in the significant number of children (20 children, 32,26±5,99% and 32 children, 42,11±5,70% concordantly). The spleen extension is recorded in the case of 7 children of the first group, 11,29±4,05% and 2 from the second, 2,63±1,85%. Flatulence was recorded in the case of 24 children, 38,71±1,61% and 18, 23,68±4,91%.

Summary

Rotavirus infection is represented by intoxication, gastrointestinal, and catarrh syndromes. The most common complication is reactive pancreatitis (in 74,19 ± 7,39% patients of 1st group and 55,26 ± 8,17% in group 2nd). In one group of 25 children (30,49 ± 5,08%) and in 42 children of 2nd groups (55,26 ± 8,17%) was noticed atsetonemic syndrome which conditioned the severity state of patients.

In the Bacteriological analysis of large intestine were identified disbalance of microbiocenosis caused by microecological problems. We identified different degrees of disbiosis in our patients. I Degree was diagnosed in the cases of 15 children (50,00%) of the first group and 12 - (40,00%) from the second group ($p > 0,05$). II Degree was diagnosed in the cases of 6 (20,00%) children in both groups ($p > 0,05$). Enteral syndrome characterized by creathorrea (27 children, 43,94±4,49%, to 41, 55,94±4,06%), steatorrea (3 children 4,84% to 19, 25,00±5,00%), Sweetheart (2 children 3,23%), amilorrea – Starch extracell (45 children, 72,58±5,71% to 48, 63,16 ± 5,56%).

Syndrome of pancreas insufficiency characterized by including of Neutral fat (steatorrea) in the cases of 3 children (4,84% to 19 25,00±5,00%), Muscle fiber modified (creathorrea) in the cases of 8 children, (12,90 ± 4,29% to 6, 7,89±3,11%).

Disorders of bile - at the rapid evacuation of chyme per the intestine – identified increased of incorporation of fatty acids (steatorrea), in 4 children (5,26% of the second group), Sweetheart in the 2 children (3,23% of group 1). Mucus contained of leucocytes and erythrocytes presented by in the small number of patients.



Rotavirus infection were represented by intoxicational, gastrointestinal and catarrh syndromes. Rotavirus infections mostly are complicated with: Reactive Pancreatopathia (43 patients, 74,19 ± 7,39 % to 55,26 ± 8,17). In the case of 25 children from the 1 group (30,49 ± 5,08%) and 42 - from the second group (55,26 ± 8,17%) we recorded Acetone-mic syndrome, which caused severeness of illness. Ultrasonography shows disorders of different degrees in the Hepatopancreatolienalis system, especially of pancreas and Hepatobiliary system, which would be which improved during the process of curation.

Key words children, diarrhea, rotavirus infection, treatment

Резюме. Ротавірусна інфекція представлена інтоксикаційним, гастроінтестинальним та катаральним синдромами. Найбільш частим ускладненням є реактивний панкреатит (у 74,19 ± 7,39 % пацієнтів 1-ої групи та 55,26 ± 8,17% 2-ої групи). Спостерігався також ацетонемічний синдром, зумовлений важкістю стану хворих (в першій групі 25 дітей 30,49 ± 5,08 % і в 42 дітей другої групи 55,26 ± 8,17 %). Бактеріологічний аналіз товстої кишки показав дисбаланс мікробіоценозу, зумовлений мікроекологічними порушеннями. Дисбіоз кишечника представлений різними ступенями порушень. I ступінь був виявлений у 15 дітей (50,00 %) першої групи і 12 дітей (40,00 %) другої групи ($p > 0,05$). II ступінь був діагностований у 6 випадках (20,00%) дітей в обох групах ($p > 0,05$).

Ентеральний синдром характеризується креатореєю (27 дітей, 43,94 ± 4,49% до 41,55,94 ± 4,06 %), стеатореєю (3 дітей 4,84 % до 19, 25,00 ± 5,00 %), мила (2 дітей 3,23 %), амилореєю - крохмаль зовнішньоклітинний (45 дітей, 72,58 ± 5,71 % до 48, 63,16 ± 5,56 %).

Синдром зовнішньосекреторної недостатності підшлункової залози характеризувався наявністю нейтрального жиру (steatorrea) у 3-х дітей (4,84 % до 19 25,00 ± 5,00 %), м'язові змієних волокон (creathorrea) у 8 дітей (12,90 ± 4,29 % до 6, 7,89 ± 3,11 %).

Порушення жовчовиділення – швидка евакуація хімусу в кишечнику – представлена підвищенням інкорпорації жирних кислот (steatorrea) в 4-х дітей (5,26 % другої групи). Слиз із включенням лейкоцитів і еритроцитів спостерігається лише у випадку невеликої кількості пацієнтів. Отже, ротавірусна інфекція була представлена інтоксикаційним, гастроінтестинальним катаральним синдромами. Ротавірусна інфекція в основному ускладнюється реактивною панкреатопатією (43 пацієнти, 74,19 ± 7,39 % до 55,26 ± 8,17). У разі 25 дітей 1 групи (30,49 ± 5,08 %) і 42 дітей другої групи (55,26 ± 8,17 %) було виявлено ацетонемічний зумовлений важкістю хвороби. Ультразвукове дослідження вказує на дисбаланс різних ступенів порушень гепатопанкреатолієнальної системи, особливо підшлункової залози і гепатобілярної, який позитивно реагував на проведені лікувальні заходи.

Ключові слова: діти, діарея, ротавірусна інфекція, лікування.

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