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EFFECT OF PROBIOTICS ON THE PARAMETERS OF ENDOGENOUS INTOXICATION, IMMUNOREACTIVITY AND INTESTINAL MICROBIOCENOSIS PATIENTS WITH SALMONELLOSIS

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The aim of the work *– to investigate the effect of probiotics on the course of salmonellosis by studying changes in indicators of endogenous intoxication, immunoreactivity and intestinal microbiota of patients.*

Patients and Methods. *A survey of 189 patients with salmonellosis. The middle age of patients was (43,23±1,22) years. They were taken to hospital at (2,26±0,08) day. Carried out: complete blood count, bacteriological examination of feces, calculated integrative indices of endogenous intoxication and immunoreactivity. Investigated a microbiocenosis of a thick gut prior to treatment and on (5,76±0,16) days from the moment of hospitalization.*

Results. *All patients with salmonellosis in the acute period had a significant increase in integrative indicators of endogenous intoxication. It was followed by violation of immunological reactivity and active adaptive reaction of an organism. All patients have a quantity of bifidobacteria, lactobacilli and escherichia coli were two-three orders less, than in control, at opportunistic pathogen increased by three-six orders of levels of other representatives, hemolyze escherichia coli and fungus class Candida (p<0,05-0,001). In convalescents receiving baseline therapy and the combined probiotic, indices endointoxication have returned to normal range (p<0,001). Under the influence the combined probiotic retract bowel dysbacteriosis. Faster normalize microbiocoenosis at the patients who have received the combined probiotic (alive lyophilized Saccharomyces boulardii 0,325×10^9; spores Lactobacillus sporogenes (Bacillus coagulans) 0,325×10^9; alive lyophilized Lactobacillus rhamnosus 0,325×10^9; alive lyophilized Bifidobacterium longum 0,325×10^9) (p<0,05-0,001).*

Conclusion. *Using the combined probiotic in curing patients with salmonellosis leads to a rapid normalization measure of endointoxication, immunoreactivity and microbiocenosis of intestinal canal.*

Key words: *salmonelloses; integrative indices intoxication; immunoreactivity; microbiocenosis; probiotics.*

Today salmonellosis is one of the most widespread anthropozoonotic disease in the developed countries. Overstability in surroundings provides sequential circulation of germ. This disease is also topical for Ukraine, it is promoted by modern economically social prerequisites.

The main clinical criteria of salmonellosis is intoxication. During the violation of metabolic process in the cellules the accumulation of toxins, pyrogen, products of the distorted metabolism and mediators of an inflammation in pathological concentration, which leads to syndrome of endogenous intoxication (SEI). Dehydration syndrome along with SEI detect extent severity of salmonellosis and it prognosis [1, 2].

Universal wide use of antibiotic lead to antibiotic resistance. Antibiotics have effect not only for pathological but also for opportunistic microorganisms, which are an integral part of physiological reaction in a human body: anticontagious screening, immunomodulatory action, barrier function, participation in metabolic process. It induces to address modern medicine to more physiological methods of restoration of a microbiocenosis – using of probiotics [3-5].

The aim of the work – to investigate the effect of probiotics on the course of salmonellosis by studying changes in indicators of endogenous intoxication, immunoreactivity and intestinal microbiota of patients.

Patients and Methods

During 2012–2016 189 patients with salmonellosis, which underwent medical treatment in Sumy Regional Clinical Infectious Hospital named after Z.Y. Krasovytskyi, were examined. They were taken to hospital at (2.26±0.08) day. All diagnostic and treatment procedures were carried out at patients' informed consent.

Criteria for enrolling were: clinical and anamnestic (hospitalization not later than 72 hours from illness onset; presence of typical clinical features of salmonellosis of moderate course – acute onset, intoxication, pain, diarrhea, dehydration); data

of epidemiological anamnesis (consumption of food of low or doubtful quality, with insufficient heat treatment, breakout etc); laboratory (bacteriological examination of stomach washing waters and/or vomiting maters and / or salmonella feces).

The following was carried out: anamnestic data collection; clinical laboratory examinations: clinical blood analysis (analyzer Cobas Micros), bacteriological feces examination, as well as integrative endogenous intoxication and immunoreactivity indicators were calculated: leucocyte intoxication index (LII), hematological index of intoxication (HII), index of leukocytes shift (ISL), Krebs index (KI), immunoreactivity index (IR), lymphocytic-granulocytic index (ILG), neutrophil-lymphocyte ratio (NLR), lymphocyte-monocyte ratio (LMR), neutrophil reactive response (NRR), index of leukocyte and ESR ratio (ILESR), lymphocyte index (Ilymph), eosinophils-lymphocytes ratio (ELR), index of allergization (IA), nuclear index (NI), index of intoxication severity (IIS) [6].

In all patients the microbiocenosis of large bowel has been investigated prior to treatment and on (5.76±0.16) days from the moment of hospitalization. At admission to hospital to all patients appoint basic therapy: gastric lavage or intestinal canal, nutritional care, oral (rehydron) or parenteral rehydration (Trisolum, Ringer's solution, 5.0 % glucose solution, 0.9 % saline solution), enzymes (Pancreatine, Mezym), enterosorbents (Atoxyl, Enterosgel).

Depending on the received therapy all surveyed were divided into four groups: CI – get basic therapy; CII – get basic therapy without antibiotics with addition of investigated combined probiotic (alive lyophilized *Saccharomyces boulardii 0,325×10⁹*; *spores Lactobacillus sporogenes* (*Bacillus coagulans) 0.325×10⁹*; alive lyophilized *Lactobacillus rhamnosus 0.325×10⁹*; alive lyophilized *Bifidobacterium longum 0.325×10⁹*), CIII – basic therapy and investigated co-formulated direct-fed microbials (probiotics); CIV – baseline therapy and otherness probiotics (lyophilized bacteria *2.5×10⁹ NCU: Lactobacillus bulgaricus – 0,5×10⁹ NCU*, *Streptococcus thermophilus – 0,8×10⁹ NCU*, *Lactobacillus acidophilus – 0.8×10⁹ NCU*, *Bifidobacterium ssp. (B. bifidum, B. longum, B. infantis) – 0.4×10⁹ NCU*) – 15 patients and (the capsule containing: folacin 1,5 mg, vitamin B12 – 15 mcg, *Lactic Acid Bacillus (Bacillus coagulans (Lb. sporogenes))* 120 million spores) – 10 patients.

The group contained 44 clinic anamnestic healthy blood donors from Sumy Regional Centre of Blood Supply Service and Transfusiology aged (37.95±1.72) years old. Sex composition of this group was equal – 22 men and women each.

All data were entered into «Electronic card of investigation». The results of clinical observation and carried out investigations were processed using method of variation statistics (Student's t-test, Pearson's chi-squared test) using software Microsoft Office Excel 2010, Statistica 10 and on-line calculator (http://medstatistic.ru/calculators/calchit.html).

Results and their Discussion

At hospitalization integrative hematological indexes were calculated and their statistic processing was carried out for EIS and immunoreactivity evaluation. It was established that LII, ISL, HII, IIS, NRR, NLR, ILESR, NI indicators increased and NI, ILG, Ilymph, ELR, IA indexes reduced. There were no reliable changes with IR and LMR (Table 1).

In the acute phase of salmonellosis there was a reduction contents in blood eosinophils, lymphocyte, monocyte and growing – segmented forms of leukocyte. It led to increase: LII – by 6.5–7.1 times, HII – by 8.5–10.0, ISL – by 2.5–2.7, IK – by 2.7–2.9 (Table 1), that means existence of endogenous intoxication and inflammatory reaction in gastrointestinal tract sick all groups [7, 8]. There was a reliable increase – ILESR (by 1.7–1.8 times), NLR (by 2.3–2.7); decrease – ILG (by 2.2–2.4). It reflects left deviation leukocytes, activation of nonspecific inflammatory process and possible progression of autoimmunes processes. Simultaneous increase in ISL and decrease in ILG demonstrates progression of endogenous intoxication and disturbances of immunologic reactivity as a result of autointoxication body in cases of destruction own cells and in case of activity bacterial endo- and exotoxins [9]. NRR was considerably increased in all surveyed by 5.3–5.5 times, that illustrative of decompensate endogenous intoxication [9, 10]. Ilymph decreased by 2.6–2.8 times, it indicates active adaptive reactions of white blood and immunodeficient of cell type, including on decrease in nonspecific anti-infective protection in consequence of intoxication. ELR reduced by 3.3–4.4 times and IA – by 2.8–3. Decrease in ELR reflects prevalence of delayed reaction over immediate hyperresponsiveness that leads to start allergenic mechanism associated with intoxication and finds the confirmation in changes in IA [9–11]. NI was increased by 7–8.3 that reflects inflammatory reaction of medium severity, changes of white blood cell lineage to antigene or cytokine stimulation. Rise of index proves intoxication and disturbance of neutrophil ability of antigen elimination due to increase in number of young forms (stab neutrophils). Presence of acute inflammatory process reflects IIS that increases by 28.8–34 ($p<0.05$) (Table 1) [6].

In convalescents majority of indicators endogenous intoxication improved, but returned to normal only in groups CII and CIII (Table 2). LII in convalescents group CII and CIII are normalized and in CIV the indicator was raised twice and high (by 2.9 times) it remained in the group CI. ISL are normalized in the groups CIII and CII, where its value was less by 1.2 – 1.4 times, than in the groups CI and CIV. LII came to normal rate in group CIII, slightly worse – in CII and CIV remained an increased by 2 times, and the worst – in group CI by 2.9 times. ISL returned to normal in groups CIII and CII, where its value was lower by 1.2–1.4 times

Table 1

Integrative indicators of endogenous intoxication and immunoreactivity in patients with salmonellosis by hospitalization

Rate (Un)	Group				
	Comparisons (n=44)	CI (n=52)	CII (n=29)	CIII (n=83)	CIV (n=25)
Intoxication index					
LII	0.70±0.07	4.53±0.35 [a]	4.93±0.61 [a]	4.98±0.33 [a]	4.99±0.60 [a]
ISL	1.62±0.10	4.06±0.28 [a]	4.32±0.43 [a]	4.20±0.22 [a]	4.39±0.42 [a]
HII	0.64±0.06	5.41±0.46 [a]	6.06±0.84 [a]	6.39±0.53 [a]	6.09±0.89 [a]
IIS	0.16±0.02	5.01±0.55 [a]	5.45±0.95 [a]	5.45±0.66 [a]	4.60±0.81 [a]
NRR	12.75±1.82	70.20±8.66 [a]	68.19±7.74 [a]	70.71±4.89 [a]	68.68±8.54 [a]
Indices of non-specific reactivity					
IR	4.65±0.36	4.20±0.38	4.26±0.40	4.17±0.34	4.27±0.37
NLR	8.88±0.91	20.73±2.27 [a]	22.32±2.35 [a]	21.96±2.16 [a]	23.91±3.19 [a]
LMR	4.77±0.45	4.13±0.38	4.43±0.46	4.09±0.33	4.65±0.56
I_{lymph}	0.59±0.04	0.23±0.01 [a]	0.21±0.01 [a]	0.23±0.01 [a]	0.22±0.02 [a]
ELR	0.080±0.009	0.024±0.009 [a]	0.022±0.006 [a]	0.018±0.005 [a]	0.018±0.007 [a]
IA	1.05±0.07	0.38±0.02 [a]	0.37±0.02 [a]	0.38±0.02 [a]	0.35±0.02 [a]
NI	0.06±0.01	0.49±0.05 [a]	0.44±0.05 [a]	0.50±0.04 [a]	0.42±0.05 [a]
Indices of inflammation activity					
KI	2.02±0.94	5.43±0.45 [a]	5.76±0.48 [a]	5.68±0.32 [a]	5.78±0.68 [a]
ILG	4.85±0.29	2.13±0.11 [a]	2.01±0.13 [a]	2.11±0.12 [a]	2.03±0.16 [a]
ILESR	1.33±0.20	2.28±0.15 [a]	2.26±0.30 [a]	2.38±0.24 [a]	2.27±0.34 [a]

Note. Significant difference of indicators ($p<0.05–0.001$, Student's t-test was used): a – in respect of control group; b – in respect of group CI; c – in respect of CII; d – in respect of CIII; e – in respect of CIV.

than in groups CI and CIV. HII recovered better in group CIII, slightly worse – the CII and CIV and the worst – in the CI group. Decrease of KI was happened with all patients: quicker it was normalized in group CIII, insignificantly above, but within norm was – in CII, and in group CIV measure wasn't normalized and was higher 1.3 times and higher – in the CI, which means preserving intoxication in mild severity. IR in the groups CII, CIII, CIV slightly increased in comparison with hospitalization and was higher, that in group of comparison and in CI had tended to increase ($t = 1.47$; $p>0.05$). It means increase of production cells cytokines, increase immunologic reactivity.

Thus, all patients with salmonellosis in acute phase had a significant increase of integrative indexes of endogenous intoxication: LII, ISL, HII, NLR, NI, IIS, KI, NRR. It was followed by violation immunologic reactivity (increase of ISL, IL ESR and decrease of ILG) and active adaptive reactions of organism (decrease of I_{lymph}, ERL, IA). About positive dynamics in these patients demonstrated integrative indexes (LII, ISL, HII, KI, ILG, NLR, I_{lymph}, ELR, IA) which didn't differ from comparisons or were much lower (NI, IIS, NRR).

Through studies microbiocenosis intestinal canal in acute phase of salmonellosis has been revealed that in all groups of patients quantity of Bifidobacterium, Lactobacillus and collibacillus was two-three orders less than in control group, at increased by three-six orders of levels of other representatives OM (opportunistic microflora), hemolyze collibacillus and phungi genus Candida. Reliable difference between groups isn't revealed (table 3).

Convalescents in the CI group the quantity of Bifidobacterium, Lactobacillus and total of collibacillus slightly increase and hemolyze microorganisms, opportunistic microorganisms, phungi genus Candida decreased, but any indicator hasn't returned to normal. The results were the worst in comparison with other groups (Table 4).

Table 2

Integrative indicators of endogenous intoxication and immunoreactivity in convalescents with salmonellosis

Rate (Un)	Group				
	Comparisons (n=44)	CI (n=52)	CII (n=29)	CIII (n=83)	CIV (n=25)
Intoxication index					
LII	0.70±0.07	2.06±0.16 [a, c, d, e]	0.86±0.04 [b, d, e]	0.57±0.02 [b, c, e]	1.38±0.08 [a, b, c, d]
ISL	1.62±0.10	2.32±0.10 [a, c, d]	1.83±0.04 [b, d, e]	1.65±0.03 [b, c, e]	2.15±0.07 [a, c, d]
HII	0.64±0.06	2.24±0.18 [a, c, d, e]	0.88±0.05 [a, b, d, e]	0.54±0.16 [b, c, e]	1.33±0.11 [a, b, c, d]
IIS	12.75±1.82	33.18±3.89 [a, c, d]	23.41±2.35 [a, b]	23.41±1.53 [a, b]	25.67±3.01 [a]
NRR	0.16±0.02	1.70±0.20 [a, c, d, e]	0.57±0.06 [a, b, d, e]	0.27±0.02 [a, b, c, e]	0.87±0.08 [a, b, c, d]
Indices of non-specific reactivity					
IR	4.65±0.36	4.30± 0.35	4.44±0.15	4,70±0,25	4.63±0.19
NLR	8.88±0.91	11.58±0.78 [a, c, d]	9.32±0.32 [b, e]	8,55±0,49 [b, e]	11.93±0.60 [a, b, c, d]
LMR	4.77±0.45	4.18±0.34	4.22±0.14	4.34±0.23	4.64±0.23
I_{lymph}	0.59±0.04	0.37±0.02 [a, c, d]	0.46±0.01 [a, b, d, e]	0.52±0.01 [b, c, e]	0.39±0.01 [a, c, d]
ELR	0.080±0.009	0.034±0.009 [a, d]	0.053±0.004 [a, d, e]	0.080±0.004 [b, c, e]	0.035±0.003 [a, c, d]
IA	1.05±0.07	0.59±0.03 [a, c, d]	0.77±0.02 [a, b, d, e]	0.96±0.02 [b, c, e]	0.62±0.01 [a, c, d]
NI	0.06±0.01	0.27±0.02 [a, c, d]	0.20±0.02 [a, b, d]	0.13±0.01 [a, b, c, e]	0.24±0.03 [a, d]
Indices of inflammation activity					
KI	2.02±0.14	2.97±0.16 [a, c, d, e]	2.22±0.05 [b, d, e]	1.98±0.04 [b, c, e]	2.59±0.08 [a, b, c, d]
ILG	4.85±0.29	3.34±0.18 [a, c, d]	4.01±0.08 [a, b, d, e]	4.41±0.09 [b, c, e]	3.56±0.11 [a, c, d]
ILESR	1.33±0.20	2.19±0.17 [a]	2.15±0.16 [a]	1.99±0.10 [a]	2.18±0.13 [a]

Note. Significant difference of indicators (p<0,05–0,001, Student's t-test was used): a – in respect of control group; b – in respect of group CI; c – in respect of CII; d – in respect of CIII; e – in respect of CIV.

Table 3

Dynamic changes microbiocenosis of intestinal canal in patients with salmonellosis in acute phase

Group	Microorganisms (lg NCU /g)/ % patients					
	Bifidobacterium	Lactobacillus	Total E. coli	Hemolyze E. coli	Other OM	Phungi genus Candida
Comparisons (n=44)	7.90±0.07/100	7.75±0.10/100	7.51±0.12/100	0.00±0.00	0.51±0.35/20.0	0.35±0.24/10.0
CI (n=52)	5.6±0.22/100[a]	5.70±0.15/100[a]	5.69±0.21/100[a]	2.19±0.26/30.8[a]	4.41±0.28/42.3[a]	2.42±0.23/36.5[a]
CII (n=29)	5.5±0.31/100[a]	5.64±0.34/100[a]	5.71±0.3/100[a]	2.0±0.3/33.3[a]	4.7±0.47/33.3[a]	2.63±0.26/26.7[a]
CIII (n=83)	5.48±0.15/100[a]	5.41±0.17/100[a]	5.83±0.12/100[a]	1.79±0.13/41.0[a]	4.2±0.16/48.2[a]	2.74±0.12/50.6[a]
CIV (n=25)	5.87±0.22/100[a]	5.73±0.15/100[a]	5.47±0.17/100[a]	1.71±0.29/28.0[a]	4.13±0.40/32.0[a]	2.56±0.18/36.0[a]

Note. Significant difference of indicators (p<0,05–0,001, Student's t-test was used): a – in respect of control group.; b – in respect of group CI; c – in respect of CII; d – in respect of CIII; e – in respect of CIV.

In the CIV group level of Bifidobacterium and Lactobacillus had tended to normalization and was higher, than in the CI group, the total quantity of Collibacillus returned to normal and disappeared Hemolyze microorganisms. The quantity of opportunistic microorganisms was lower than in the CI group and more reliable than in group of comparison and CII, CIII. The level of phungi genus Candida remained high (Table 4).

Table 4

Dynamic changes microbiocenosis of intestinal canal in patients with salmonellosis in the period of recovery

Group	Microorganisms (lg NCU /g)/ % patients					
	Bifidobacterium	Lactobacillus	Total E. coli	Hemolyze E. coli	Other OM	Phungi genus Candida
Comparisons (n=44)	7.90±0.07/100	7.75±0.10/100	7.51±0.12/100	0.00±0.00	0.51±0.35/20.0	0.35±0.24/10.0
C I (n=52)	6.21±0.14/ 100 a, c, d, e	6.43±0.18/ 100 a, c, d, e	5.96±0.19/ 100 a, c, d, e	1.40±0.16/ 19.2 a, d, e	2.95±0.15/ 42.3 a, c, d, e	1.90±0.23/ 19.2 a, c, d
C II (n=29)	7.71±0.19/ 100 b, e	7.47±0.13/ 100 b, e	7.25±0.17/ 100 b	1.80±0.20/ 16.7 a, d, e	1.33±0.17/ 30.0 a, b, e	1.13±0.13/ 26.7 a, b, e
C III (n=83)	7.79±0.09/ 100 b, e	7.63±0.08/ 100 b, e	7.23±0.11/ 100 b	0.00±0.00 b, c	1.30±0.11/ 24.1 a, b, e	1.08±0.08/ 14.5 a, b, e
C IV (n=25)	6.87±0.17/ 100 a, b, c, d	7.00±0.14/ 100 a, b, c, d	7.20±0.14/ 100 b	0.00±0.00 b, c	2.0±0.19/ 32.0 a, b, c, d	1.88±0.30/ 32.0 a, c, d

Note. Significant difference of indicators (p<0,05–0,001, Student's t-test was used): a – in respect of control group; b – in respect of group CI; c – in respect of CII; d – in respect of CIII; e – in respect of CIV.

In the groups CII and CIII Bifidobacterium, Lactobacillus and total quantity of collibacillus had normalized, there wasn't the reliable difference with comparisons group. In the group CIII, where was carried out the antibiotic therapy, hemolyze microorganisms disappeared, and in the group CII remained increased by 5.4 times. In the groups CII and CIII the levels of opportunistic microorganisms and phungis genus Candida had tended to normalization and were the lowest in comparison with the groups CI, CIV (Table 4).

Conclusions

1. On expressive endogenous intoxication and inflammatory reaction in patients with salmonellosis in acute phase specifies increase of integrative indexes of intoxication: LII, ISL, HII, NLR, NI, IIS, KI, (p<0.05), and change of NRR (p<0.05) – to decompensation. Simultaneous increase of ISL, EL ESR and decrease of ILG (p<0.05) connected with endogenous intoxication and abnormality of immunologic reactivity affected by autointoxication. Decrease of Ilymph, ELR, IA (p<0.05) caused by active adaptive reaction of leukocytes and immunodeficient disease cell type, in particular decrease in nonspecific antiinfective protection as a result of intoxication and reflects prevalence of delayed reaction by immediate-type hypersensitivity, what brings to the launch of allergic mechanisms affected by endogenous intoxication.

2. The convalescents which got baseline therapy and combined probiotic the indices of endogenous intoxication LII, ISL, HII, KI, ILG, NLR, Ilymph, ELR, IA returned to normal (p<0.001). NI and IIS in the same group weren't normalized, but were the lowest in comparison with others groups (p<0.001). The index NRR was the lowest in groups CIII and CII. It demonstrates reduction of endogenous intoxication, normalization of leucogram and immune response.

In group of the patients who didn't receive antibiotics and used combined probiotic LII, ISL, KI, NLR are normalized (p<0.001). HII, IIS, ILG, Ilymph had more accurate tendency to normalization, than in groups CI and CIV (p<0.001). IA та NI had the best tendency to normalization in groups CII and CIV, that in the group CI.

3. In acute phase in all groups of patients quantity of Bifidobacterium, Lactobacillus and collibacillus was two-three orders less, than in control, at increased by three-six orders of levels of other representatives opportunistic microorganisms, hemolyze collibacillus and phungi genus Candida (p<0.05–0.001).

4. At treatment with the using of combined probiotic intestinal dysbacteriosis had decreased. The microbiocenosis at patients is quicker normalized, which receiving tested probiotics – the groups CII and CIII (p<0.05–0.001). The tendency to normalization is observed at persons which were treated by anothers probiotics (CIV) (p<0.05–0.001). The worst indicators are received at baseline therapy treatment (CI) (p<0.05–0.001).

The prospects of further researches: the received results give the grounds for development of modern methods of treatment of salmonellosis and objectification of severity of a disease.

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ВПЛИВ ПРОБІОТИКІВ НА ПОКАЗНИКИ ЕНДОГЕННОЇ ІНТОКСИКАЦІЇ, ІМУНОРЕАКТИВНОСТІ ТА МІКРОБІОЦЕНОЗ КИШЕЧНИКУ ХВОРИХ НА САЛЬМОНЕЛЬОЗ

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Мета. *Для встановлення ефекту пробіотиків у хворих на сальмонельоз вивчили зміни показників ендогенної інтоксмикації, імунореактивності та складу кишкової мікробіоти пацієнтів.*

Пацієнти і методи. *Обстежено 189 хворих на сальмонельоз. Їх середній вік становив (43,23±1,22) роки. Здійснювали загальний аналіз крові з підрахунком показників ендогенної інтоксикації, бактеріологічне дослідження калу та встановлення показників імунореактивності. Мікробіоценоз товстої кишки досліджували до лікування і на (5,76±0,16) добу після госпіталізації.*

Результати. *У всіх пацієнтів з сальмонельозом у гострому періоді відбувалось значне збільшення інтегративних показників ендогенної інтоксикації. Це супроводжувалось порушенням імунологічної реактивності і активною адаптивною реакцією організму. Також відбувалось зменшення на два-три порядки кількості біфідобактерій, лактобацил і кишкової палички, при збільшенні на три-шість порядків рівнів інших представників УПМ, гемолізуючої кишкової палички та грибів роду Candida (p<0,05-0,001). У реконвалесцентів, які отримували базисну терапію і комбінований пробіотик, показники ендогенної інтоксикації прийшли до норми (p<0,001). Під впливом комбінованого пробіотика зменшується дисбактеріоз кишечнику. Найшвидше нормалізується мікробіоценоз у пацієнтів, які отримували досліджуваний пробіотик (живі ліофілізовані Saccharomyces boulardii 0,325×10^9; спори Lactobacillus sporogenes (Bacillus coagulans) 0,325×10^9; живі ліофілізовані Lactobacillus rhamnosus 0,325×10^9; живі ліофілізовані Bifidobacterium longum 0,325×10^9) (p<0,05-0,001).*

Висновок. *Використання комбінованого пробіотика в лікуванні хворих на сальмонельоз приводить до швидкої нормалізації показників ендогенної інтоксикації, імунореактивності, а також мікробіоценозу товстої кишки.*

Ключові слова: *сальмонельоз, показники ендогенної інтоксикації, імунореактивність, мікробіоценоз, пробіотики.*

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