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ENDOGENOUS INTOXICATION IN SIMULATED EXPERIMENTAL FECAL PERITONITIS

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Abstract

Peritonitis is one of the most serious and serious complications of pathology of the abdominal organs, which is characterized by a very high mortality rate. In acute peritonitis there are violations of the mechanisms of detoxification, accompanied by the development of endogenous intoxication syndrome. Studies of these indicators are important for predicting further diagnosis, tactics and treatment of this pathology.

The aim was: to study the dynamics of changes in endogenous intoxication in an experimental study of acute fecal peritonitis in white laboratory rats.

As a result of the experiment, a significant increase in the level of MDA, TOS, NO, on the first day and the third relative to the control group. Analyzing the TAC indicator, it was confirmed that it decreased on the first and third days relative to the control group. Comparing the relationship between TOS and TAC found a strong inverse correlation between these indicators. While a direct strong correlation has been established between MDA and TOS levels. On the first day, no significant increase in TNF-α was found, while on the third day it increased significantly relative to the control group.

Keywords: *Peritonitis, endogenous intoxication, sepsis.*

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Introduction

Peritonitis is a severe inflammation of the visceral peritoneum, accompanied by a deterioration in the body's condition [1, 2, 3]. Requires emergency surgery, if treatment is not timely, a lethal outcome is possible [4, 5]. Peritonitis complicates the course of other diseases and conditions - appendicitis, pancreatic necrosis, pancreatitis, hernia infringement [6]. The main causative agents of peritonitis are microflora of the gastrointestinal tract, tuberculous mycobacteria, pneumococci, gonococci, and streptococci. In 60-80% of observations, peritonitis develops due to the simultaneous activity of several agents [7, 8].

Common sources of infection in peritonitis are the duodenum, stomach, gallbladder, pancreas, small intestine, colon, bladder, and kidneys. One of the most common causes of fecal peritonitis is bacterial infection of the gastrointestinal tract [9]. The peculiarity of this pathology is that the process begins without obvious symptoms and develops very quickly. In most cases, peritonitis is treated with surgery. When fecal peritonitis occurs, the activity of many organs is disrupted. Fecal peritonitis occurs when fluid in the abdominal cavity is contaminated with intestinal contents [10, 11].

The ingress of feces into the peritoneal cavity is considered a prognostically unfavorable factor and significantly aggravates the course of peritonitis. Among the causes of severe peritonitis, an important place is occupied by the syndrome of endogenous intoxication, which is a consequence of the entry into the biological environment of the body a significant amount of toxic metabolic products [12, 13]. Endogenous intoxication syndrome is a complex symptom complex characterized by disturbance of water-electrolyte metabolism, macro- and microcirculation, changes in cells at the ultrastructural level [14, 15].

Changes in the human body in peritonitis are due to the action of toxic substances, such as biologically active substances in excessive concentrations, products of lipid peroxidation (LPO) and impaired metabolism, microbial endotoxins and exotoxins. The activation of lipid peroxidation is one of the characteristic of endogenous intoxication syndrome. The activity of lipid peroxidation processes in intestinal tissues under conditions of peritonitis has not been studied enough [16, 17].

Currently, the study of LPO in fecal peritonitis requires research to further develop new effective methods for correction and treatment of this pathology.

The aim was: to study the dynamics of changes in endogenous intoxication in an experimental study of acute fecal peritonitis in white laboratory rats.

Materials and methods

Mature nonlinear female rats weighing 180-220 grams were used in the experiment. Experimental animals were divided into two groups - control and experimental. In this experiment, 40 rats were involved. The control group was 10 rats, and experimental 30 rats (15 rats were withdrawn from the experiment on the first day, and the other 15 on the third day). The study group simulated fecal peritonitis. Acute widespread peritonitis was modeled by V.A. Lazarenko et al. by intraperitoneal administration of 10% fecal suspension in an amount of 1 ml. per 100 g of body weight [18].

The suspension was filtered twice through a double layer of gauze and was administered to the rats immediately after preparation. The fecal suspension was injected into the abdominal cavity by puncturing the ventral wall in the center of the midline of the abdomen, the end of the needle was directed alternately to the right and left hypochondrium, right and left iliac areas. In order to avoid damage to internal organs, rats were kept upright, with the caudal end facing up. Animals were removed from the experiment on the third day by decapitation under thiopental anesthesia.

The experiment was conducted in the conditions of the central research laboratory Ivan Horbachevsky Ternopil National Medical University of the Ministry of Health of Ukraine in compliance with the general rules and regulations of the European Convention for the protection of vertebrates used for research and other scientific purposes (Strasbourg, 1986) [19,20].

Blood was centrifuged at 350g rpm and 4°C for 10 minutes and supernatants were collected for study. After that, malondialdehyde (MDA), nitric oxide (NO), total antioxidant capacity (TAC), total oxidant stress (TOS), and tumor necrosis factor alpha (TNF-

α) were studied from blood samples in the biochemical laboratory.

Rat Malondialdehyde (MDA) ELISA Kit MBS268427 - was used for malondialdehyde. Cayman Chemical Company 780001 Nitrite Colorimetric Assay kit was used for nitric oxide. Total Antioxidant Capacity Assay Kit Sigma Aldrich MAK187 was used for total antioxidant capacity. Rat Tumor Necrosis Factor α ELISA Kit RAB0479 was used for tumor necrosis factor alpha (TNF-α).

Experimental studies were conducted in accordance with the rules established by the Directive of the European Parliament and the Council (2010/63 / EU), by the order of the Ministry of Education and Science, Youth and Sports of Ukraine No. 249 of March 1, 2012 "On Approval of the Procedure for conducting scientific experiments, experiments on animals by scientific institutions " and methodical recommendations.

Statistical processing of the material was performed using a personal computer and a Microsoft Excel spreadsheet application using the "STATISTICA-10 for Windows®-6, 0" package. Graphs were designed using the programs "Microsoft Excel 7.0". P < 0,05was considered statistically significant.

Results

As a result of our study, the following results were obtained. There was a significant increase in the level of MDA on the first day (p = 0.012) and 3 days (p = 0.038) relative to the control group. However, no significant difference was observed between indicators for 1 and 3 days (p = 0.535). There was a significant increase in the level of TOS on the first day (p = 0.012) and 3 days (p = 0.0002) relative to the control group. However, no significant difference was found between the indicators for 1 and 3 days (p = 0.189). Assessing the NO index, an increase in its concentration was found for 1 day (p<0.001), for 3 days (p<0.001) relative to the control group. There was also a significant difference between the data for 1 and 3 days (p = 0.001). Analyzing the TAC indicator, it was reduced by 1 day (p = 0.004) and 3 days (p = 0.001) relative to the control group. However, no significant difference was found between 1 and 3 days (p = 0.323). Comparing the relationship between TOS and TAC, a strong inverse correlation was found between these indicators (r = -1,000). While a direct strong correlation was found between the levels of MDA and TOS (r = +1.000). On day 1, there was no significant increase in TNF-α (p = 0.118), while on day 3 it increased significantly (p = 0.046) relative to the control group. Statistically, the indicators for 1 and 3 days did not differ (p = 0.706). (Table 1).

Peritonitis is an inflammation of the visceral or parietal peritoneum. If not treated properly, there may be complications such as sepsis, which can cause irreversible changes in the body. The pathology we are studying is one of the most important causes of death on the planet, even if we consider the development of modern medicine, good levels of drugs and antibiotics, it still remains difficult to treat. We know that inflammation and immunological dysregulation are activated by many mechanisms and can lead to a decrease in the functions of many organs. Also in the process of peritonitis, there are unexplained pathological mechanisms, so the need to create and reproduce experimental models of this pathology is urgent.

Conclusions

In laboratory animals on the background of experimental fecal peritonitis there is a significant imbalance of oxidative- rooxidant systems on the first day of the study relative to the control group. At the same time, comparing these indicators for the first and third days in most cases, no significant increase was found. Stably high rates from the first day correspond to the toxic stage of reactive peritonitis (24-72 hours). Probably the depletion of oxidative-prooxidant systems occurs from the fourth day, due to the transition of the disease to the terminal stage of peritonitis.

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Table 1. Comparative dynamics of researched indicators.

Index / Group	Control group (n=10)	1 day (n=15)	3 day (n=15)
MDA (mmol/mL)	0.68 ± 0.14	1,68 ± 0.34	2,14 ± 0.65
TOS (μmol/L)	31.43 ± 12.14	79,18 ± 12.63	101,3 ± 10.5
NO (μM/L)	3.98 ± 0.37	6,01 ± 0.35	8,2 ± 0.51
TNF-α (pg/mL)	2.56 ± 1.27	16,7 ± 8,6	21,4 ± 8,85
TAC (mmol/L)	1.45 ± 0.11	0,79 ± 0.18	0,48 ± 0.25