Effect of Natural Biocorrector Namivit on Free-Radical Processes in Abdominal Delivery

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Translated from *Byulleten' Eksperimental'noi Biologii i Meditsiny*, Vol. 134, No. 11, pp. 532-534, November, 2002
Original article submitted September 2, 2002

Free-radical oxidation parameters were measured in the blood of women during preparation to cesarean section and postoperative period and in the umbilical blood and placenta. A course of biocorrector Namivit before the intervention prevented intensification of free-radical processes in the mother—placenta—fetus system.

Key Words: *free-radical oxidation; abdominal delivery; antioxidants*

Maternal mortality and morbidity largely depends on correct choice of the method of delivery. Methods of surgical delivery are of special importance in this context [9]. Recent trend to extending the range of indications for abdominal delivery (AD) is aimed at improvement of labor outcomes for the fetus and mother [5], and hence, prevention of complications during and after cesarean section is one of the main problems of obstetrics [14].

Similar to other surgical interventions, AD is associated with operation (surgical) stress characterized by polyfunctional changes in the body [8,11]. These changes cause numerous complications and become life threatening in case of insufficient adaptive compensatory potentialities of the organism [10]. One of the most important molecular mechanisms of these disorders is oxidative stress (imbalance of free-radical processes), characterized by excessive generation of reactive oxygen species (ROS) and/or insufficient capacity of the antioxidant systems [15].

Recent research is aimed at creation of drugs with adaptogenic and antioxidant effects. Among the recent achievements are nucleotide preparations with nonspecific adaptogenic effects. One of them is Namivit, a food additive (Vektoprom) based on baking yeast [6,7]. Namivit includes vitamins PP, B_1, B_2, B_6, biotin, folic acid, low-molecular proteins, free amino acids, low-molecular peptides, macro- and trace elements. Namivit is approved by the Department of State Sanitary Epidemiological Surveillance of the Ministry of Health of the Russian Federation and allowed for use as a bioactive food additive. Addition of Namivit to combined therapy for diabetes mellitus led to a decrease of LPO intensity and increase in activities of antioxidant enzymes, shifting the balance between LPO and endogenous antioxidants maintaining the antiperoxide and antiradical potential of the cells towards the latter [2].

We investigated the possibility of using Namivit in preparing pregnant women to planned AD.

MATERIALS AND METHODS

The study was carried out in 40 pregnant women hospitalized at Maternity Hospital No. 2, Saratov. AD was planned for all patients. Clinical examinations on admission included anamnesis recording, detection of concomitant diseases, and entire complex of clinical laboratory studies. The majority of women were not primigravidae and had a history of artificial abortions (aggravated obstetrical anamnesis) and complications of the current pregnancy (gestosis during the first half of pregnancy, threatened abortions, gestoses).

The patients were divided into 2 groups, 20 per group, with similar demographic, anamnestic, and clinical characteristics. Women with grave course of pregnancy and exacerbations of chronic diseases were not

Municipal Maternity Hospital No. 2, Saratov

0007-4888/02/1345-0457$27.00

included. The patients of the two groups did not differ by the initial status, concomitant diseases, and mean age (28.3±0.9 and 29.2±1.5 years in the main and control groups, respectively).

Patients of the control group received placebo for 2 weeks before AD, patients of the control group received Namivit in a dose of 500 mg 3 times daily starting from week 32 of gestation. Concomitant treatment was the same in both groups and included vitamin therapy and spasmolytics.

Venous blood was collected before the course of treatment and directly before, immediately after and 4 h, and 7 days after the operation. Umbilical blood and placental samples were collected during the operation. Plasma, erythrocyte mass, and working fraction of the placenta were prepared as described previously [3,4]. The intensity of free-radical processes was evaluated by the contents of 2-TBA-reactive substances (TBARS) [4] and ROS generation was assessed by the intensity of H_2O_2-induced luminol-dependent chemiluminescence [12]. The results of measurements were expressed in optical density units/ml plasma and as a ratio of the maximum chemiluminescence values in samples with and without biological material. The content of free SH groups was evaluated by the reaction with Ellman reagent [3]. Activity of erythrocyte SOD was evaluated by the NBT reduction test in the system of superoxide radical generation by phenasine methosulfate/NADH [13].

The results were statistically processed using Student's *t* test.

RESULTS

The content of TBARS in the control significantly surpassed the initial level before and immediately after AD (Table 1), which can be explained by psychoemotional stress before planned intervention. Namivit prevented accumulation of TBARS: their content in venous blood remained below the control until day 4 postoperation. ROS generation was higher than in the control immediately and 4 h after AD in the placebo group (Table 1). Namivit prevented excessive generation of ROS during this period. The content of free SH groups in the plasma decreased in the control 4 h and 7 days after AD, which reflected the imbalance of free-radical processes, while in the main group their content virtually did not change during the entire period of observation. Hence, the dynamics of free-radical oxidation parameters was more benign in the group treated with Namivit in comparison with the placebo group. Starting from the preoperative period, SOD activity in erythrocytes increased in the main group in comparison with the control, which can partially explain the detected antioxidant effects of Namivit.

In the umbilical blood the generation of ROS, contents of TBARS and SH groups in the main group was below the control (Table 1). Despite similar intensity of ROS generation and TBARS content in the placenta in the control and main groups (both parameters were 1.4-fold higher in the placebo group), the contents of glutathione and SH groups significantly decreased in the group treated with Namivit (Table 2).

TABLE 1. Effects of Namivit on Free-Radical Processes in Venous Blood of Women before and after AD and in Umbilical Blood (*M*±*SEM*)

Material	TBARS, opt. dens. units/ml	ROS generation, %	SOD, U/mg Hb	SH groups, nmol/liter
Venous blood				
initially	12.7±2.1 11.8±1.9	153.2±70.5 247.0±89.0	39.4±3.2 41.1±6.4	284.9±43.1 335.7±50.0
before AD	20.0±1.8$^+$ 11.5±1.0*	288.7±66.5 286.4±54.2	36.5±3.4 57.8±4.8*	289.2±34.3 336.5±29.3
directly after AD	16.4±1.7$^+$ 7.5±0.9*	339.2±71.4$^+$ 194.0±34.5*	51.5±2.3 58.2±1.9*	226.6±29.5 316.9±30.0
4 h after AD	12.9±2.0 5.5±0.9*	681.1±109.0$^+$ 307.0±97.0*	52.5±2.5 65.0±3.4*	173.7±18.9$^+$ 386.1±20.1*
7 days after AD	15.9±2.2 13.0±2.1	194.0±34.5 141.6±29.1	53.2±3.8 74.6±4.1*	171.0±22.3$^+$ 281.5±21.0*
Umbilical blood	2.0±0.3 1.8±0.2	1494.2±301.3 406.1±89.0*	34.2±2.0 52.2±3.1*	310.52±25.6 599.86±30.1*

Note. Numerator: placebo group; denominator: group treated with Namivit. Here and in Table 2 $p<0.05$: *compared to placebo group; $^+$compared to initial content.

TABLE 2. Effect of Namivit on Free-Radical Processes in the Placenta (*M*±*SEM*)

Parameter	Placebo	Namivit
ROS generation, %	6230.9±950.1	4373.4±1431.2
TBARS, opt. density units/mg protein	0.076±0.011	0.053±0.07
SH groups, nmol/mg protein		
glutathione	0.14±0.12	2.13±0.75*
protein	30.5±2.3	42.4±3.4*

This indicates essential improvement of the placental antioxidant status after Namivit treatment.

Recent studies proved the important role of free-radical oxidation processes in mother during pregnancy and labor and in the development of fetus and newborn. Free-radical LPO processes in the mother—placenta—fetus system are clinically significant, while the parameters of free-radical processes in the placenta are an important biochemical characteristic of its membranes [1]. Namivit corrected the imbalance of free-radical processes developing during preparation of pregnant women to AD, during and after the operation, which is an evidence of a favorable effect of this food additive. We previously showed that hypoxic training had a potent antistress effect, arresting the oxidative stress during planned AD [1]. Namivit produced a similar adaptogenic effect, but the use of this food additive in a hospital setting is much simpler than hypoxic training. A course of Namivit therapy is recommended for combined preparation of pregnant women to AD.

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