

Materials of Conferences

**THE ACTIVITY OF ANTI-OXIDANTS
ENZYMES IN ERYTHROCYTES
IS AN INDICATOR OF FATIGUE
IN TRAINING**

¹Chigrinski E.A., ¹Sosnin M.I., ²Conway V.D.,
¹Metirinski J.J., ¹Efremenko E.S.

¹Omsk State Medical Academy, Omsk;

²Omsk State Agrarian University, Omsk,

e-mail: chigrinski@list.ru, chigrinski@dr.com

Professional sports training is often accompanied by excessive exercise, which often leads to the development of fatigue. Fatigue can cause a decrease in the organism's performance and its resistance towards adverse conditions. Existing methods of the diagnosis of fatigue are not always effective, which impedes the appropriate correction of the developed metabolic abnormalities.

There is a lot of data in scientific literature reporting that an elevation in the levels of creatinine, urea, lactic, β -hydroxybutyric acid, and triglycerides was observed in the athlete's blood during excessive exercise. However, the concentrations of these metabolites rise in the early stages of the athlete's training, thus making it impossible to use them as fatigue markers. Therefore, the search for biochemical parameters, which are not affected by the optimal level of exercise but are significantly altered during excessive exercise, is very important. The enzymatic activity of the antioxidant system in erythrocytes could be such a parameter.

Erythrocytes are easy to isolate from the athlete's blood specimen, taken at any stage of preparation. The activity of enzymes is less affected by the sample preparation, which is often delayed. An increase in the period between taking the blood sample and its analysis could lead to the accumulation of metabolites or to the decrease of its concentration which could eventually lead to an incorrect conclusion. Therefore, the detection of the enzyme's activity is more preferable.

For our study we've chosen the enzymes of the antioxidant system since, as it well known, any exercise is a strong activation factor of free radical processes. From this point of view, the most interesting enzymes are super oxide dismutase (SOD) and catalase (CAT). These enzymes belong to the first level of antioxidant defence and as such interact with reactive oxygen species directly.

The aim of this study was: to establish the connection between the intensity of the exercising and the activity of the enzymes of the antioxidant system and to explore the possibility to use such enzymes as markers of fatigue.

The experiments were performed on 30 Wistar rats, which were separated into 3 groups. The first

group was a control group (group C). The second group comprised of the animals with an optimal exercise regime (OE). During the experiment, which lasted for five weeks, these rats were swimming with a load, constituting 10% of their body weight, until tired every other day. This swimming regime provided the maximum physical activity for the rats without over-training. The third group comprised of rats with an excessive exercise regime (E group). The animals in this group were swimming with the same load until tired every other day for the first three weeks and then the rats were swimming every day for the last two weeks, which led to the development of fatigue. During the experiment, the time of effective swimming was taken into the account (TES). After the completion of the experiment the concentrations of creatinine, lactic acid, β -hydroxybutyric acid were measured in the rats' blood. The total protein concentration and the activities of superoxide dismutase (SOD; ECEC 1.15.1.1) and catalase (CAT; ECEC 1.11.1.6) were determined in hemolysate. The statistical analysis of the data was performed using *t* Student criterion.

The results obtained revealed that in the OE group changes among the biochemical parameters, which are normally tested in sports medicine, were observed. For example, the concentration of lactic acid in rats of the OE group increased by 20% ($P=0,029$) compared to the control group. During the optimal exercising regime a pattern of increase of β -hydroxybutyric acid concentration (by 22% n. s.) was observed. The creatinine concentration was increased by 19% ($P=0,032$) in the OE group compared to the control.

In the blood of rats in the excessive exercise group a sharp increase of lactic acid concentration was observed, which was 82% ($P < 0,001$) and 52% ($P < 0,001$) as compared to the C and OE groups, respectively. This could be due to the enhancement of anaerobic glycolysis, caused by oxygen deficiency in tissues. The concentration of β -hydroxybutyric acid in the blood of rats in the EE group was higher than its concentration in the animals of the C and OE groups by 68% ($P=0,041$) and 38% ($P=0,028$) respectively. This could be due to the enhanced oxidation of fatty acids, which compensates for insufficient ATP production under the excessive exercise condition, and also due to the slower oxidation of the acetyl-CoA from formed in ketone bodies in Krebs cycle reactions. In turn, this leads to the development of ketoacidosis in tissues, which, as well as lactic acidosis, changes the activity of the enzymes.

The changes in the enzyme activity during exercise of any intensity had a different pattern than

the changes in the conventionally used parameters. SOD and CAT activities in rats in the OE and control groups were not statistically significant. The SOD activity in erythrocytes in rats of the E group decreased (by 45% ($P < 0,001$) and 41% ($P < 0,001$) compared to the similar parameter in groups C and OE, respectively), while CAT activity decreased by 57% ($P < 0,001$) and 50% ($P = 0,001$).

During the optimal exercising regime, the experimental animals increased TES, which indicates that the ratio between time spent in training and recovery periods were adequate. In the EE group a decrease in TES was observed, which suggests the development of fatigue in animals. We considered that the best parameters to use for the indication of the development of fatigue would be the parameters which are not affected during the optimal training regime but rapidly change during the excessive exercise regime. According to our results, such indicators could be the enzyme of the antioxidant system of erythrocytes, i.e. the activity of the enzymes SOD and CAT. Unlike the parameters which are conventionally used in sports medicine, these parameters are not affected during the optimal training regime. Therefore, the activity of the enzymes SOD and CAT could be used as effective markers of fatigue.

The concentrations of creatinine, lactic acid and β -hydroxybutyric, which depend on the rate of the accumulation of these metabolites, on the rate of their degradation and re-utilisation, are more variable. The statistically significant increase in the concentrations of these metabolites in the OE group allows the use of these parameters as markers of tiredness during the optimal exercises, rather than as markers of fatigue. Further investigations, which required the participation of athletes from various kinds of sports, could confirm or dispute the results.

Conclusion. Optimal exercise led to a moderate increase in the concentration of lactate and creatinine in the blood of rats, while excessive exercise was accompanied by a substantial increase of creatinine, lactic and β -hydroxybutyric acids. During the optimal exercise regime, the activity of superoxide dismutase and catalase in erythrocytes was not affected, while the excessive exercise regime led to steep decay in the activity of these enzymes. The data obtained revealed changes in the parameters, which are conventionally used in sports medicine, which proves them to be inefficient indicators of fatigue. We consider that the enzymes of the antioxidant system in erythrocytes could be effective markers of the fatigue.

The work is submitted to the International Scientific Conference «Actual problems of science and education», Germany, (Dusseldorf-Cologne), November, 8-15, 2013, came to the editorial office on 19.11.2013.

THE CLINICAL AND MORPHOLOGICAL CHARACTERISTICS OF THE STOMACH AND DUODENAL ULCER BY THE OPIUM NARCOMANIA

Guseinova Z.K., Tayzhanova D.Z., Toleuova A.S., Beysembekova Z.A., Tauesheva Z.B.

Karaganda State Medical University, Karaganda,
e-mail: aliyatoleuova@yahoo.com

According to WHO data in the world more than 200 million people use narcotics [1]. Usage of narcotic drugs affects to the somatic pathology character and demands pathogenic treatment development. The Altai cleared mummy is applied at the disturbance of acidic production damage (hypo, hyper antacid conditions) at the stomach and duodenum ulcer. It is used as a preparation rendering protective and antitoxic effect that allows recommending it for treatment of patients with the specified stomach pathology and drug addiction.

The purpose of our research was clinical-morphological justification of the possibility of Altai mummy preparation in complex treatment of the patients with drug addiction who has stomach and a duodenum ulcer.

Material and research methods. In clinical conditions it were surveyed 70 patients, who has distributed in two groups: the I group (main) were 40 patients with drug addiction had stomach and duodenum pathology aged from 18 till 40 years. Usage duration of opium group psychoactive agents composed from 1 to 10 years. The average daily dose of psychoactive agent was 2,0–3,0 grams. The II group (comparisons) composed 30 patients with stomach and duodenum pathology without drug addiction.

At the detailed poll in the anamnesis of both group patients (I and the II groups) are found the following risk factors as systematic food intake disturbances and diet regimen damage (at 70% patients), long psychoemotional loads (64%) and adverse heredity by the ulcerative disease (32%). For the purpose HP eradication in the I group of patients is prescribed antibacterial therapy with amoxicillin 500 mg \times 2 times a day, clarithromycin 500 mg \times 2 once a day, a vegetative cytoprotector as mummy 0,2 g by 1 tablet \times 2 times in a day, proton pump inhibitor Omeprazol 20 mg 1 \times 2 times a day within the 14 days.

The biopsy materials of the stomach and duodenum were taken on endoscopy, fixed at 10% of formalin solution, filled with paraffin. Paraffinic sections painted with hematoxylin and Eosin, methylene blue and looked through a light microscope. Contamination of a stomach mucosa with *Helicobacter pylori* (Hp) determined by stomach biopsy materials and urease express-test and morphologically by the coloring methylene blue [2].

Investigation results and discussion. The microscopic picture of the stomach and duodenum ulcers in both investigated groups had a morphological variety of processes, the inherent is long developing wavier pathological process with exac-