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Dedicated to the memory of Prof. dr. Ioan Silaghi-Dumitrescu marking 60 years from his birth

THE VALUES OF BIOCHEMICAL INDICATORS IN PEOPLE WHO PRACTICE 'MAINTENANCE' AEROBICS

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ABSTRACT. Physical effort affects by its stressful character the homeostatic level of the body, resulting in acceleration of biochemical reactions of aerobe and anaerobe nature. This article presents dynamics in the variation of some of the biochemical parameters of the blood in women who practice 'maintenance' aerobics.

Keywords: *effort, biochemical indicators, homeostasis*

INTRODUCTION

Biochemical parameters represent an area of investigation with various implications in terms of health control, quality of life as well as predisposition to certain pathological conditions arising from a labor that exceeds the effort capacity of the body. Studies conducted to date indicate that metabolic changes that occur during intense muscle activity largely depend on biochemical parameters and affect the efficiency of physical effort.

The aim of this study was to demonstrate that variations of certain biochemical indicators such as glucose, triglyceride levels, uric acid, magnesium and serum creatinine depend on the intensity of physical effort and they, in turn, act on the rate of achieving metabolic changes, disturbing the working capacity of the organism. The study of these parameters in women who have not practiced any sports before is of practical and public interest as more and more women turn to aerobics as a way to shape their body. When specific literature studies focus mainly on athletes or on items such as glucose and triglycerides, parameters like uric acid, magnesium and serum creatinine are vaguely raised. Therefore, our research intends to provide a complete, updated picture of the evolution of these five parameters in women aged 20-30 years old who practice aerobics.

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RESULTS AND DISCUSSION

The statistical tests applied revealed the results shown in Table 1.

Table 1. P values obtained after applying Student t Test

	January -April	April- July	January- July
Glucose (mg%)	**0,05**	**0,047**	**0,001**
Triglycerides (mg%)	0,08	0,42	0,07
Uric Acid (mg%)	0,17	0,28	0,34
Creatinine (mg%)	0,2	0,07	**0,03**
Magnesium (mg%)	0,19	**0,02**	0,07

* p ≤ 0.05-significant
** p ≥ 0.05-insignificant

Glucose values have significantly diminished in the interval January-April and January- July 2009, as seen in Figure 1. Diminished blood glucose values were significantly lower than the ones presented in the reference range (p = 0.001), in a gradual decrease.

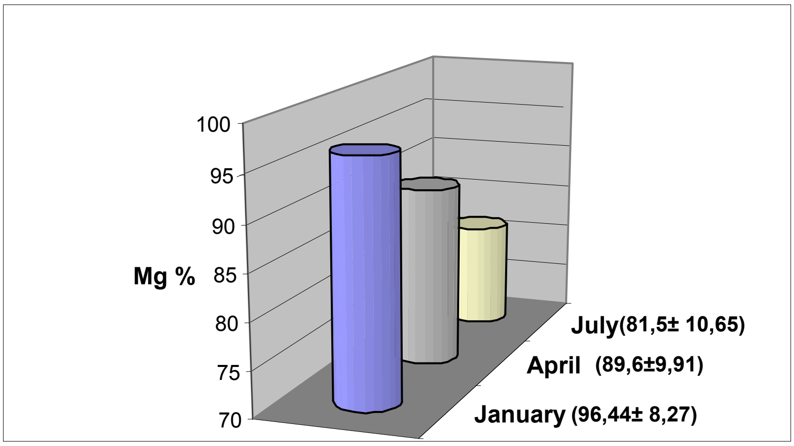

Figure 1. Glucose levels in January-July period (average± standard deviation)

In comparison with our study, similar results were obtained, but on obese, sedentary postmenopausal women who completed a 6-month (three times per week) program of aerobics.[1] Use of glucose during exercise and the amount of blood sugar metabolized per unit of insulin plasma as an indicator of insulin sensitivity increases only when weight loss is accompanied by exercise [1].

Although insignificant (statistically) changes were recorded, a decrease of triglycerides values suggests lipid mobilization after moderate physical exertion (Figure 2).

Studies performed on women aged between 30 and 50 after a single 60-minute aerobics session show an increase of free fatty acids during effort [2], as triglycerides stored in the fat tissue can be mobilized and sent in the form of free fatty acids used as an energy source and circulating lipids.

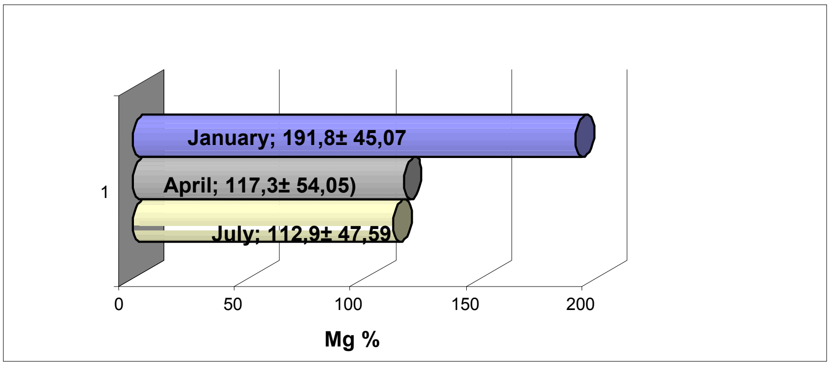

Figure 2. Mean values of triglycerides± standard deviation

Our study indicates that in the long-term effort uric acid presents an increase of the numerical values (Figure 3). Despite the fact that the variations had p>0,05, the mathematical increases of this indicator of free purines that were recorded are considered a sign of persistent metabolic fatigue or incomplete biochemical recovery.

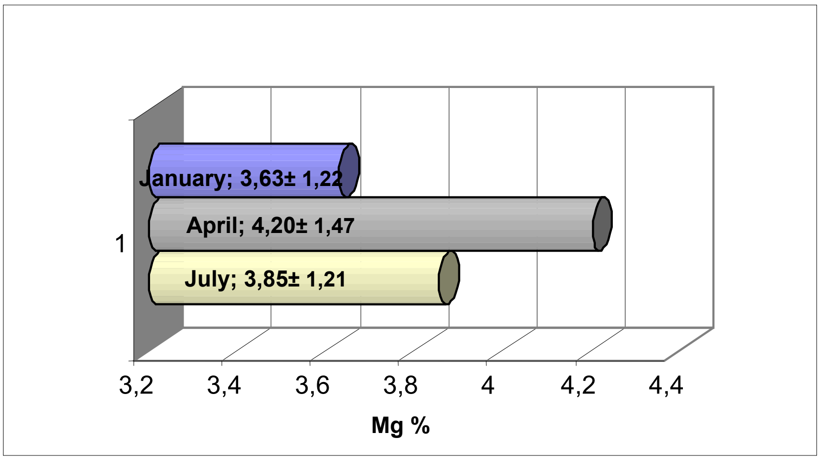

Figure 3. Uric acid-mean value changes (± standard deviation)

Specific literature contains limited knowledge concerning the evolution of uric acid during physical effort. Studies made on animals (horses subjected to a prolonged effort-endurance races) specify that uric acid can be used as a biochemical parameter in determining the metabolic activity during effort [3].

The hypomagnesaemia condition that was obtained in the first part of our study -January-April (although statistically insignificant) can be explained as a redistribution of magnesium in the body to accommodate the metabolic needs of our study participants-that were not prior engaged to any physical activity. However, a statistically significant numerical increase ($p = 0.02$) of magnesium in plasma in the April-July interval (after 6 months of prolonged effort, Figure 4), does not correlate with other findings concerning the conditions in which plasmatic Mg increases after physical exertion.

Magnesium is involved in many functions of the skeletal muscle. Other studies connect the inadequate intake of magnesium (in the form of pills or diet) with a deficiency status in athletes participating in sports requiring weight control. [4]

Specific literature explains hypomagnesaemia as stress caused by physical exercise or as the effect of lipolysis (since fatty acids are mobilized for muscle energy, lipolysis would cause a decrease in plasma Mg) whereas hypermagnesaemia occurs at athletes following short term high intensity exercise as the consequence of a decrease in plasma volume and a shift of cellular magnesium resulting from acidosis [5].

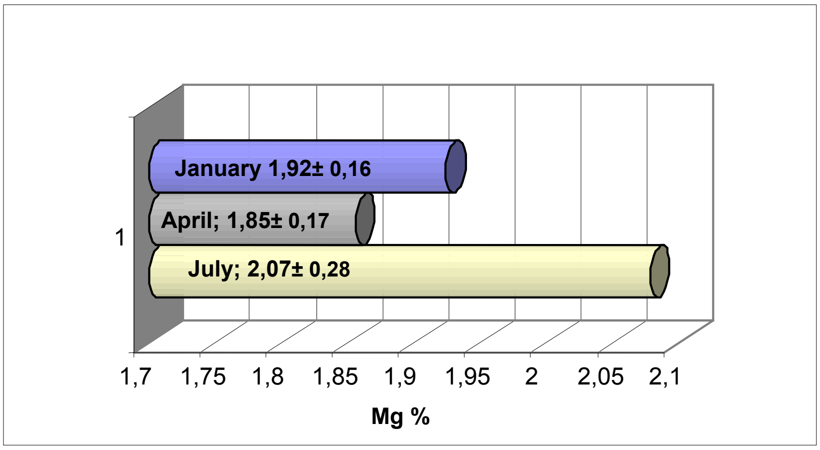

Figure 4. Changes of average values of magnesium (± standard deviation).

With regard to serum creatinine, this biochemical parameter increased significantly in July ($p = 0.03$) compared to the reference range-January (Figure 5).

In comparison with our study, other authors use the elevations of serum creatinine as an indicator of exertion-related muscle damage produced in healthy individuals that were subjected to a single session of 50 eccentric exercises.[6]

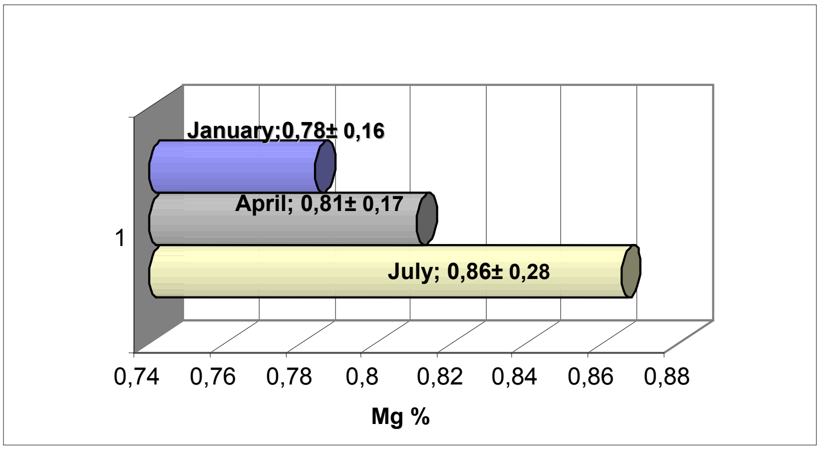

Figure 5. Serum creatinine changes during exercise and post-effort (mean values ± standard deviation)

CONCLUSIONS

1. The significant decrease of glucose parameters indicates that the physical strain was intense enough to mobilize blood sugar reserves. Furthermore, the fact that the values of this parameter have been progressively decreasing during the experiment point toward the fact that the participants had a balanced diet.

2. A decline of triglycerides levels, although statistically insignificant, reveals that the effects of physical exertion on the body in terms of weight loss facilitates fat mobilization and allows the energy deficit to rely less on a hypocaloric diet. On the other hand, exercises performed at moderate levels of intensity counteract undesirable lipid changes that occur with age.

3. The increase of uric acid and decrease of magnesium during the period January –April is a sign of incomplete metabolic recovery. However, reversing this report in the April-July interval, with the decline of uric acid and an increase of magnesium, point toward a better correlation between the effort capacity and the intensity of physical effort.

4. A continuous numerical increase of serum creatinine levels indicates a sustained muscular effort of the subjects.

5. Our data are gain added relevance compared to other studies from the fact that the determinations are made in three different points (January-April-July), focusing on the evolution on the biochemical parameters in time.

6. This study complements the existing data in literature concerning glucose, triglycerides, and adds new, innovating information on the changes of uric acid, magnesium and serum creatinine with reference to the increasingly segment of the population represented by women who practice aerobic workouts.

7. The practical applicability is more than obvious because progressively more women turn to aerobics as a method of maintenance. Therefore, the need of a personal, customized training program arises, that adjusts to the possibilities and necessities of each person in order to prevent internal imbalances such as our study showed.

EXPERIMENTAL SECTION

Our study refers to a group of 20 female subjects, aged 20-30 years, who have performed workouts with an aerobe character during January-July 2009. The exercises were carried out with a frequency of 3 sessions per week, 60 minutes each session. For the gradual accommodation of the body during exercise, the focus was on the slow adaptation of the subjects through the execution of movements that were destined to the selective influence of the locomotor's apparatus.

The determination of biochemical parameters in the collected blood was carried out at a specialized laboratory.

During the study, changes of the biochemical indicators were monitored in the following ranges:

- Baseline (control data/before the training program began) - January 2009;
- Second determination - after 2 months - beginning of April, 2009;
- Last investigation - July, 2009.

Statistical analysis

Data were analyzed using the Statistical Analysis Toolpak. To calculate batch variations Fisher test was used and for comparing data obtained from investigations T test: Two Sample Assuming Equal Variances and T-Test: Two Sample Assuming Unequal Variances were used. $p < 0.05$ was considered significant. Correlation coefficients were calculated with the help of Correlation function-Data Analysis.

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