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The Effect of a Single Circuit-Resistance and Aerobic Exercise on Plasma Obestatin Levels in Well-Trained Females

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Abstract

Introduction: Obestatin is recently described as a gastrointestinal (GI) hormonal, which is involved in the pathophysiology of obesity. It decreases food intake and body weight by decelerating gastric emptying. The purpose of this study was to investigate the impact of a single circuit-resistance exercise and aerobic exercise on plasma obestatin and growth hormone (GH) in well-trained females.

Material and Methods: 24 participants from Khorasani female athletes were randomly selected and assigned into three groups: control (N=8), circuit-resistance exercise (RE) (N=8) and aerobic exercise (AE) (N=8). Blood samples were collected from all the participants before and immediately after the exercise protocol.

Results: Changes in plasma obestatin levels were not significant within and between groups. Plasma GH concentrations were significantly higher in experimental groups compared to the control group.

Discussion and Conclusion: The data indicated that although circuit-resistance and aerobic exercise resulted in a significant change in GH levels, they had no effect on plasma obestatin levels.

Keywords: Obestatin, Growth hormone, Circuit-resistance exercise, Aerobic exercise, Females

Introduction

Ghrelin is a 28-amino-acid peptide that has been isolated from human and rat stomach mucosa. It is recognized as a novel player in the gut–brain regulation of growth hormone (GH) and energy balance [1,2]. In addition to ghrelin, obestatin is a 23 amino acid peptide secreted by the stomach that is involved in regulating energy balance [3]. As ghrelin, Obestatin is also secreted from parietal cells gastric mucosa and both are derived from genes preproghrelin [4- 6]. The original study reporting the discovery and function of obestatin demonstrated that the intraperitoneal and intracerebroventricular injections of obestatin inhibited food intake and reduced body weight in mice [3]. The effects of obestatin on feeding have been confirmed by independent investigators [7-9], however, the majority of studies suggest that obestatin does not have anorexigenic effects, regardless of injection site [10-12]. The initial description of obestatin also reported that it inhibited gastrointestinal motility [3]. However, a number of subsequent studies failed to replicate this effect [13-15], recent studies by Inui and colleagues, however, demonstrated that intravenously administered obestatin could inhibit gastrointestinal motility, acting via corticotropin-releasing factor (CRF) receptors in the hypothalamic nuclei of the brain [16,17]. Although the majority of obestatin is produced by the stomach, the obestatin peptide has been reported to be expressed in a range of peripheral tissues, including the pancreas, testis, mammary gland, thyroid, and lung [3, 18]. This may indicate that obestatin has local autocrine/paracrine roles in addition to its actions as an endocrine hormone. Obestatin, like other hormones, is secreted into the blood and performs its task through its receptors (ligand Orphan) in different parts of the body. Obestatin hormone appeared on both amid and unamid isoform, the amid form is apparently active physiologically [19]. However, the researches recognize both obestatin isoforms as bioactive [20]. In hormonal and metabolic studies there are still

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many questions about obestatin level changes regarding the effect of exercises as one of the factors affecting energy balance. Research on the mechanisms of this hormone and its compatibility with exercise has always been the issues of interest for researchers, especially in the field of exercise physiology. Wang et al. in 2008 showed a short training period (40 minutes running on a treadmill with a slope of 5 degrees) led to significant changes in plasma obestatin levels [21]. Ghanbari Niaki et al. investigated the response of obestatin plasma to short-term anaerobic interval exercise training. Results showed that a short-term anaerobic exercise had no effect on plasma obestatin [22]. In a study examined gene expression of obestatin in lymphocytes in response to a session aerobic exercise. There was no significant change in gene expression of obestatin in lymphocytes [23]. Research on the obestatin hormone response to exercise is very limited but the findings are consistent. The purpose of this study is determining the effect of a single session aerobic and circuit-resistance exercise on obestatin levels and growth hormone (GH) concentrations in young training females.

Material and methods

Participants and research design

The present study consists of three groups: pre-test and post-test which is a quasi-experimental one. During a call, 24 participants were selected among Khorasani female athletes and randomly assigned to three groups of 8 participants: control, circuit-resistance and aerobic exercise (table 1).

Written consent was obtained from the 24 participants. Then they were asked to complete a medical examination and a medical questionnaire to ensure that they were not suffering from any disease, were not taking any medication, and were not using steroids. All the groups were completely familiarized with all of the experimental procedures and had their one repetition maximum (1RM) determined for each of the 9 exercises used in the circuit-resistance exercise protocol.

Table 1: Anthropometric characteristics of participants

Variables	Control group (N=8)	Aerobic group (N=8)	Circuit resistance group (N=8)
Age (years)	21.37±1.76	21.12±2.35	21.87 ± 3.04
Height (m)	161.69±1.85	163.12±5.20	160.5 ± 3.99
Weight (kg)	59.68±7.65	58.25±7.80	56.35 ± 9.31
BMI(kg/m^2)	22.88±3.49	21.82±1.92	21.8 ± 3.01
Body fat (%)	19.67±1.65	19.67±5.51	18.29 ± 3.14

Values are means ± SEM.

Exercise testing procedures

Participants were prohibited from any physical activity three days before the training program. RE group completed a circuit-resistance exercise protocol (arm curl, triceps extension, back extension, squat 90^o, leg curl, bench press, overhead press, dead lift, seated row) as reported

in previous studies [21, 22]. AE group was asked to travel 1.5 miles with a fixed heart rate (70% VO_2max) run [23]. Their heart rate was controlled using a digital gauge (Polar) . The resistance exercise sessions were held in the morning between 08:30 a.m. and 11:00 a.m. to avoid the effects of circadian rhythm. All the participants were reported to the lab after an overnight fast (at least 12 h, allowed to drink only pure water). The duration of the whole program was 25 min for RE group and almost 15 min for AE group.

Experimental methods and sampling

Before and after the training sessions, a sample of 10cc blood from brachial vein of all the participants was collected. Blood samples were collected in test tubes with EDTA anticoagulant and speed centrifugation (2000 rpm speed for 10 minutes) was used to measure plasma obestatin and growth hormone (GH)levels. Obestatin plasma levels were measured by sandwich ELISA method using human kits from American companies. Mentioned

sensitivity was 78 pg ml. coefficient percent of variation within a test was determined 9/6%. Growth hormone (ELISA kit dbc Canada) of the samples was measured according to the manufacturer's instructions.

Statistical analysis

All calculations were done using SPSS/PC version 16.0. All data are presented as mean ± standard error of mean (SE). We used Levene's test to assess homogeneity of variances and Kolmogorov-Smirnov test to examine normal distribution of the data. The data were analyzed using t-student dependent test (paired comparison) for pre- and post-values, while between-group comparisons were done using one-way ANOVA. Statistical significance was accepted at $p < 0.05$ (table 2).

Results

The findings obtained from this study indicated that a session of circuit resistance and aerobic exercise resulted in a significant increase in the level of growth hormone compared to the rest time in the experimental group ($P < 0.017$, $P < 0.002$, respectively), the increases was also significant in the aerobic group. However the levels of obestatin plasma did not change significantly immediately after exercise compared to its levels before the exercise,($P < 0.867$ and $P < 0.448$) (Fig 1 and 2).

Table 2: Plasma obestatin and GH levels in the subjects

Variables	groups	Before protocol	After protocol	P-Value
Obestatin (ng/ml)	Control group	4.350±0.73	4.325±0.49	0.911
	Circuit-resistance group	3.65 ± 0.71	3.625 ± 0.44	0.448
	Aerobic group	4.20±1.08	4.325±0.83	0.448
GH (ng/ml)	Control group	0.675±0.464	0.7±0.432	1.00
	Circuit-resistance group	0.657 ± 0.41	4.30 ± 1.83	0.017*
	Aerobic group	0.7±0.432	8.175 ± 1.359	0.002*

Values are mean ± S.E.

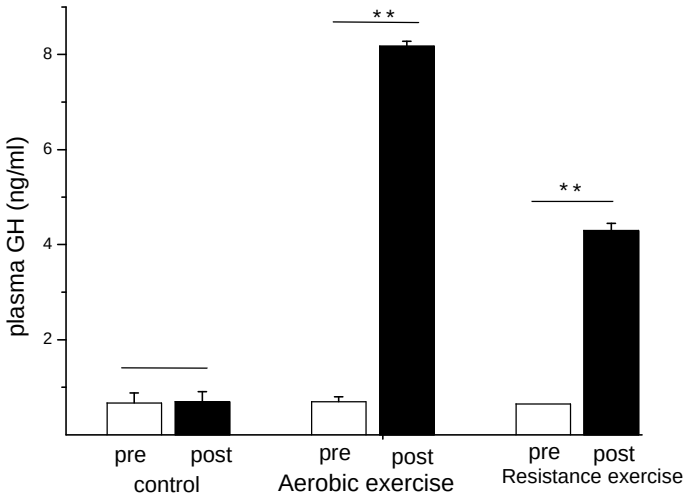

Figure 1: Plasma GH pre and after Exercise in experimental and control groups pre- and immediately post exercise.
**: p<0.01

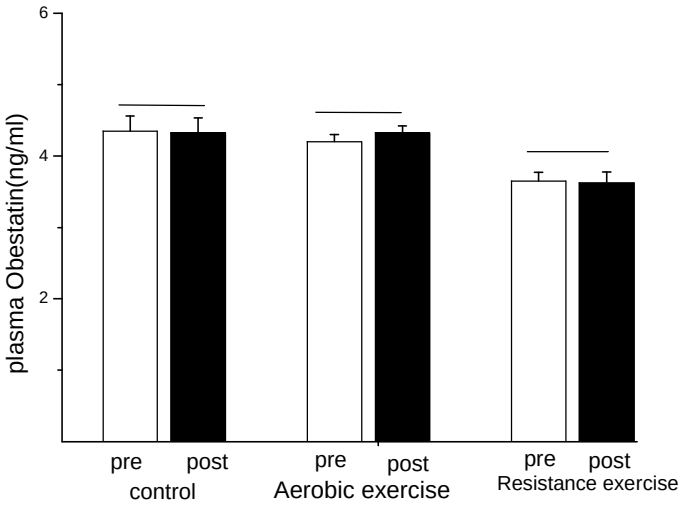

Figure 2: Plasma obestatin concentrations in three groups pre- and immediately post exercise.

Discussion and Conclusion

In response to a circuit-resistance and aerobic exercise session, obestatin plasma levels did not change, but growth hormone showed a significant increase immediately after the protocols. In the research of Manshouri et al. that examines the effect of a short-term aerobic exercise on obestatin plasma levels, it has been shown that plasma obestatin levels did not change in participants and the researchers concluded that obestatin level is not influenced by short-term exercise [24]. Ghanbari-Niaki et al. investigated the plasma obestatin response to a session of circuit resistance exercise with different intensities. In this study, participants began exercise with an intensity of 40%, 60% and 80% of one maximum repetition. Results showed that a session of circuit-resistance exercise with different intensities has no impact on plasma obestatin, while plasma GH rate increased with exercise intensity. According to the researchers' viewpoints, obestatin does not any role in increasing GH caused by resistance activity [20].

There is a lack of explicit data expressing the mechanisms through which resistance exercise may affect obestatin levels. . Few researches have been done on the impact of physical activity on this peptide. It seems that the type and duration of the exercise program were effective in the kind of observed responses and adaptations. In some studies an exercise session failed to alter the level of obestatin [19, 20], but in some others increasing the exercise time, has changed obestatin levels [25, 26]. Also, it appears that various tissues, such as the hypothalamus, fundus and small intestine, show different responses to exercise. Obestatin injected into the brain inhibits food intake, and indicates its impact on the central nervous system [27, 28].

On the other hand, obestatin inhibition of gastrointestinal activity sends a message from the vagus nerve to the center of food intake and causing satiety in the central nervous system [29-31]. A significant negative relationship has been found between growth hormone levels, obestatin fundus and small intestine [26]. Since in the present study, a significant increase was observed in plasma GH concentration as the result of exercise, it seems to leads to inhibition of the increase in plasma GH levels obestatin through negative feedback. In general, it can be concluded that unlike ghrelin, obestatin cannot be counted as a significant factor in short term regulation and energy balance. To sum up, the data of the present study show that plasma obestatin levels did not increase significantly after a session aerobic and circuit-resistance exercise. It may be offered that intensity, duration and type of protocol used in this study, did not affect plasma obestatin levels. Clearly, more research is needed to accurately determine the obestatin role as a hormone involved in regulating energy balance and body weight.

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