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PRELIMINARY DATA REGARDING THE EFFECT OF PROTEIN SUPPLEMENTATION ON CARDIOVASCULAR ADAPTATION TO EFFORT

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Abstract: *Preparations based on whey proteins are used by practitioners of bodybuilding to support effort and increase muscle mass. We want to check the hypothesis that nitric oxide resulted from protein supplementation affects cardiovascular adaptation to effort. For this we recorded heart rate and arterial blood oxygen saturation before and after a series at pec-deck machine consists of many repetitions at the end of an exercise consisting of at least two such series. Subjects were 12 bodybuilding practitioners, both beginners and trained, users or not of protein supplements. Average heart rate increased more for the consumers of protein supplements, trained or untrained. The results suggest that supplementing with whey protein influences both immediate and the duration cardiovascular adaptation to effort owing to induce vasodilation.*

Key words: *whey protein, heart rate.*

1. Introduction

It is known that in patients with heart failure who have preserved the ventricular ejection fraction the supplementation with L-arginine or L-citrulline improves the function of right ventricle by increasing the ventricular ejection fraction and possibly by lowering the pressure in the pulmonary artery [5]. From arginine is synthesized nitric oxide (NO) [7], which has a vasodilatory effect [2]. Whey proteins have the ability to improve vascular function in individuals suffering from pre-hypertension, among mechanisms being also an increased production of NO [6].

2. Purpose

Since whey proteins are widely used as supporters of physical effort and to promote muscle growth by bodybuilding practitioners, we intend to investigate their effect on cardiovascular adaptation to effort.

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3. Hypothesis

We hypothesized that whey protein increases the production of NO and it has a vasodilatory effect influencing the cardiovascular adaptation to effort.

4. Research Methods

The study was conducted on 12 volunteers, masculine gender, practitioners of bodybuilding at sport club "New Power Gym" from Iasi. Using a Beurer pulse oximeter were measured heart rate (HR) and arterial blood oxygen saturation ($Sp0_2$) before and after the subjects performed a series at pec-deck machine. Because of the desire of participants that the study does not influence their training program, and the necessity of observing variations of physiological constants during endurance, we have chosen as reference a series of an exercise executed at pec-deck machine, which typically require small weights and high number of repetitions.

For HR were calculated mean values and standard deviations (for each category of subjects included in the study), and between groups of users of protein supplements (trained and untrained) and those who do not use such supplements statistical comparisons were performed with Anova Single Factor.

5. Content of the Experiment

Individualized training programs have involved different numbers of sets and repetitions. Table 1 shows the anthropometric characteristics of the subjects and positioning in the exercise of the series for which measurements were made. The table also includes possible quality of trained of the subject as well as whether he use supplements based on whey protein.

Table 1

Gender, age, height and weight of the subjects participating in the study; position in the exercise at pec-deck machine of the series for which measurements were made and the number of repetitions

subject	age (years)	height (cm)	weight (kg)	location in the exercise executed at the pec-deck machine of the series for which measurements were made (bolded)	trained	using supplements based on whey protein
1	16	174	64	12, 12, **15**	-	-
2	15	175	59	15, **15**	-	-
3	31	175	80	9, 10, **10**	-	-
4	27	178	76	10, 10, **10**	x	-
5	40	178	106	8, 8, **10**	x	-
6	24	190	102	10, 10, **10**	x	-
7	21	175	58	10, 10, **10**, 10	-	x
8	34	180	82	8, **16**	-	x
9	27	183	85	15, 12, **10**	x	x
10	24	185	100	10, 10, **10**	x	x
11	25	173	75	12, 10, **9**, 6	x	x
12	35	185	86	10, 10, **10**	x	x

6. Results and Discussions

The results are summarized in tables 2, 3, 4, 5 and 6.

Table 2

Heart rate (HR) and arterial blood oxygen saturation (Sp02) before and after the series executed at the pec-deck machine for untrained subjects who do not use protein supplements

subject	**initial HR (beats/minute)**	**initial $Sp0_2$**	**final HR (beats/minute)**	**final $Sp0_2$**
1	99	96	100	98
2	94	97	97	97
3	110	98	120	97
mean and standard deviation	101±8.18		105.66±12.5	

Table 3

Heart rate (HR) and arterial blood oxygen saturation (Sp02) before and after the pec-deck series, for trained subjects who do not use protein supplements

subject	**initial HR (beats/minute)**	**initial $Sp0_2$**	**final HR (beats/minute)**	**final $Sp0_2$**
4	131	97	132	97
5	98	97	94	97
6	95	97	95	98
mean and standard deviation	108±19.97		107±21.65	

Table 4

Heart rate (HR) and arterial blood oxygen saturation (Sp02) before and after the series executed at the pec-deck machine for untrained subjects who use protein supplements

subject	**initial HR (beats/minute)**	**initial $Sp0_2$**	**final HR (beats/minute)**	**final $Sp0_2$**
7	109	98	147	99
8	125	97	148	99
mean and standard deviation	117±11.31		147.5±0.7	

Table 5

Heart rate (HR) and arterial blood oxygen saturation (Sp02) before and after the series performed at the pec-deck machine for trained subjects who use protein supplements

subject	**initial HR (beats/minute)**	**initial $Sp0_2$**	**final HR (beats/minute)**	**final $Sp0_2$**
9	87	82	87	97
10	99	98	113	97
11	76	98	99	98
12	66	97	85	98
mean and standard deviation	82±14.21		96±12.91	

Table 6

Average values and standard deviations of HR for subjects who use protein supplements and for nonusers, with statistical significance according to Anova Single Factor

	initial HR (beats/minute) for subjects who do not use protein supplements		final HR (beats/minute) for subjects who do not use protein supplements	
	104.5±14.18		106.33±15.83	
statistical significance (Anova Single Factor)	p=0.98			
	initial HR (beats/minute) for subjects who use protein supplements		final HR (beats/minute) for subjects who use protein supplements	
	93.66±21.75		113.16±28.41	
statistical significance (Anova Single Factor)	p=0.54			

Although for each category the number of subjects is too small for statistical significance, preliminarily we appreciate that heart rate increased more for subjects who reported the use of protein supplements, both to the untrained and for those trained. In trained subjects that do not use protein supplements the average final HR (107 ± 21.65) is even slightly lower than the mean initial HR (108 ± 19.97). The possibility of an accidental error is 2 times lower in comparison by Single Factor Anova in sample using protein supplements (p = 0.54 vs. p = 0.98). The explanation may consist in the vasodilator effect of NO [2]. In patients with heart failure vasodilator therapy increases the efficiency of left ventricular systole [3]. We can assume a similar effect in healthy subjects, to which decreased peripheral resistance would be accompanied by increased heart rate. Nitric oxide resulted from the whey protein metabolism is probable added to the NO produced by the active skeletal muscle during exercise [1], which enhances the vasodilatory effect. This mechanism is supported by the evolution of the subject 9 to which heart rate remained the same but $Sp0_2$ increased from 82 to 97. The fact that at the trained subjects that do not use protein supplements have been registered higher initial heart rate (in the interval between series) than in trained subjects who use whey protein to support the effort capacity suggests that protein supplementation influences not only immediate cardiovascular adaptation to effort but also the long-term adaptation.

7. Proposals

These preliminary results are of importance for both sports training and therapeutic (in cardiovascular kinetotherapy). Thus, in etiopathogeny of heart failure is incriminated inclusive an altered in functioning of the arteriolar

smooth muscle, resulting in increased peripheral resistance [4]. We believe that the protein supplementation to these patients would be beneficial for both the recovery of muscle strength and to improve the symptoms of heart failure, by facilitating the ventricular systole.

8. Conclusions

Preliminary data shows that whey protein supplementation leads to a more marked increase in heart rate during bodybuilding exercises performed with small resistances and large number of repetitions. This effect was observed both for trained subjects and untrained ones.

Data from the literature, and determination of the degree of oxygen saturation of arterial blood suggests that the mechanism is the vasodilation resulting from the nitric oxide produced by the catabolism of proteins, additional of the one produced by active skeletal muscle during exercise.

Cardiovascular adaptation is influenced both in short term and the long term, which may have therapeutic implications and also in sport training.

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