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Effects of probiotic supplementation on glycemic and lipidemic status in trained body builders

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ABSTRACT

With attention to beneficial effects of probiotics on glycemic status and cholesterol level, this study is conducted in order to answer the question of what affect the use of probiotic supplements on glycemic and lipidemic indices in body-builder athletes. Athletes were randomly assigned to two groups taking probiotic and placebo groups, respectively. The procedure has four main steps include: 1-PEPS; pre-exercise and pre-supplementation (onset of experiment), 2- EPS; post-exercise and pre-supplementation (after first time exercise and before supplementation), 3- ES; post-exercise and post-supplementation (after first time exercise and 30day probiotic/ or starch capsule supplementation), 4- ESE; post- supplementation and post-exercise (after 30day probiotic/ or starch capsule supplementation and after second time exercise). Blood samples were taken at each of these four steps. Before probiotic-supplementation, subjects attended the aerobic training. Next, subjects have Bruce test. Probiotics (familac) in capsule was as a combination of several types of probiotics (dosage of 1 capsule per day). Based on obtained result, there is no any considerable difference between groups for insulin and glucose levels before and after probiotic supplementation. The probiotic supplementation and second exercise caused significant decrease in plasma lipids, whereas high density lipoprotein- cholesterol (HDL-C) was not differed between control and supplemented group. In conclusion, probiotic supplementation along with exercise protocol (trained-individual) may have considerable hypolipidemic effect via decreasing total cholesterol and triglyceride, whereas didn't have considerable effect on glucose and insulin level in trained athletes.

Key words: Dietary supplements, Exercise, Lipid markers, Probiotic, Treadmill-tests.

INTRODUCTION

Health effects of probiotics in the prevention and treatment of diseases such as colon cancer, hyper-cholesterolemia, high blood pressure, constipation, diarrhea, lactose intolerance, irritable bowel syndrome, osteoporosis, allergies and urinary- genital tract infections are documented (Pyne et al., 2013).

Nowadays, probiotics are considerable dietary supplements, and probiotic-complexes are produced and purchased continuously. Femilac is a supplement with mixture of probiotics includes 7 strains of bacteria and fructose oligosaccharide prebiotic for improves probiotic activity (Pirotta et al., 2004). Currently, following a study on immunological effect of this kind of probiotic supplements, it has been reported that femilac can be a selected probiotic supplement for athletes (Aghaei et al., 2013). In Aghaei et al., (2013), Athletes who received femilac-supplemented after exhaustive exercise (aerobic exercise show high levels of monocytes, granulocytes and

lymphocytes, respectively. In this study (Aghaei et al., 2013) and other studies of lactobacillus probiotic effects on the athletes (Gleeson et al., 2011; Lamprecht et al., 2012), hormonal responses and blood biochemical parameters have not been studied. Intensive training and difficult jobs decrease the strength of the immune system and digestive disorders are followed, poor performance can cause chronic fatigue in athletes. Although there is no evidence on the energetic effects of probiotics but the secondary positive effects on athletic performance via reducing fatigue during exercise, improve immune function and maintain a healthy digestive system, are taken into consideration (Nichols, 2007).Studies on species of probiotics in athletes are limited to L. caseiL.Fermentus, L.Acidophilus and L.rhamnosus(Nichols, 2007; West et al., 2009).

Also, so many studies on effects of probiotics on glycemic status have been conducted in non-athletic individuals or animal models (Mahboobi et al., 2014; Ivey et al., 2014; TaghizadehandAsemi, 2014). Chinese researchers have just released an animal study that found that *Lactobacillus acidophilus* and *Bifidobacterium* can decrease serum lipids and glucose and improve insulin resistance (Yu et al., 2013).*Bifidobacteria* probiotic resulted in a considerable reduction of total cholesterol and LDL (Bordoni et al., 2013). In a study, “probiotics” are suggested as natural cholesterol lowering agents (Awaisheh et al., 2013).

With attention to beneficial effects of probiotics on glycemic status and cholesterol level, this study is conducted in order to answer the question of what affect the use of probiotic supplements on glycemic and lipidemic indices in body-builder athletes.

MATERIALS AND METHODS

In present study, effect of oral probiotic supplement on serum parameters, after exhaustive exercise (two time exercise) in male athletes has been examined. The procedure has four main steps include: *1-pre-exersice and pre-supplementation (onset of experiment), 2- post-exercise and pre-supplementation (after first time exercise and before supplementation), 3- post-exercise and post-supplementation (after first time exercise and 30day probiotic/ or starch capsule supplementation), 4- post- supplementation and post-exercise (after 30day probiotic/ or starch capsule supplementation and after second time exercise)*

The populations of groups are professional bodybuilding athletes from East Azerbaijan province – Iran, and the sample included 14 male bodybuilders (three days a week, regular physical activity and exercise at least 5 years) in the age range 55-20 years.

Subjects were randomly assigned to two groups taking probiotic and placebo groups. Participants prior to the implementation of the exercise program to initial measurements, such as measurement of anthropometry, such as height, body mass and heart rate at rest and adaptation with the treadmill and standardized test to determine HRmax and VO_{2max} in sport location protocol attended.

Bruce test

Before supplementation, subjects attended the afternoon for aerobic training. Subjects after 5 min exercise (a walk on the treadmill), have Bruce test (Bruce et al., 1949) (table 1). In the end, Bruce-subjects cooled down for 5 minutes to warm up the same way will do. The second phase of work was completed after 28 days, so the first step was repeated.Place in the pre-and post-supplementation, as well as pre-and post-exercise blood samples from the subjects of the study were to measure the variables.

Table1. Bruce test procedure

Stage	Speed (km/hr)	Speed (mph)	Gradient
1	2.74	1.7	10
2	4.02	2.5	12
3	5.47	3.4	14
4	6.76	4.2	16
5	8.05	5.0	18
6	8.85	5.5	20
7	9.65	6.0	22
8	10.46	6.5	24
9	11.26	7.0	26
10	12.07	7.5	28

Aerobic power or maximal oxygen consumption using exhaustive testing (treadmill running) and it was calculated by the formula of the first-stage test speed of 1.7 miles per hour (2.47 miles per hour) and began a steep 10 per cent each phase velocity of 1.3 km on the clock and 2% was added to the gradient system. Lag time when subjects were able to continue (table1)

- *Probiotic supplementation*

Probiotics in capsule form used in this study as a combination of several types of probiotics and Familac dosage of 1 capsule per day. After the first bout of exercise protocol 30 capsules of probiotics or placebo were consumed (1 per day for 28 days).

Multiple oral probiotic bacteria lactate was used as a product of the Iranian ZistTakhmir Company, Iran. Probiotic strains used in this product are: L. Casei (CFU/g 109×5.1), L. Acidophilus (CFU/g 109×2), Lactobacillus C. (CFU/g 109×5.1), L. Bulgaricus (CFU/g 108×2) , B. Breve (CFU/g 1010× 2), B. Longum (CFU/g 109× 7), S. Thermophilus(CFU/g 109× 5.1). In addition fructo-oligosacharide as prebiotic products was used for growth and activity of probiotics.

About when and how to use (best time 1 hour after the meal with water) and avoid eating yogurt or other supplements affect the research process was presented. Placebo capsules contents starch only.

- Laboratory and statistical analysis

Laboratory analyses were conducted by autho-analyzer using special Elisa kits for insulin, in a biomedical laboratory.

Collected data were analyzed by SAS software Ver. 9.1 and comparisons between variables was done via Unpaired T-test, ($P<0.01$, and 0.05).

RESULTS AND DISCUSSION

Serum insulin, glucose, TC, triglyceride, and HDL-C levels of two experimental groups at different steps of experimental exercise protocol are presented in table 2 and 3.

In according to table2, there is no any considerable difference between groups for insulin and glucose levels before and after probiotic supplementation.

Serum TC and triglyceride had decreases following probiotic supplementation, also after second exercise ($P<0.01$; table 3). In other word, the probiotic supplementation and second exercise caused significant decrease in plasma lipids, whereas HDL-C was not differed between control and supplemented group.

Table2.Glycemic indices;*Serum insulin and glucose level of probiotic (femilac)-supplemented athletes during 4 steps of experimental procedure*

Treatments[1]	Insulin (U/ml)				Glucose (mg/dl)			
	PEPS	EPS	ES	ESE	PEPS	EPS	ES	ESE
Control (placebo)	1.01	0.62	1.20	0.88	98.25	97.75	90.50	90.25
Probiotic (femilac supplemented)	0.84	0.58	0.98	0.72	93.00	94.00	92.75	94.25
P value[2]	0.132	0.327	0.053	0.385	0.771	0.902	0.810	0.578
SEM[3]	0.166	0.091	0.162	0.189	12.181	11.870	11.961	4.811

[1] ***PEPS:*** *pre-exercise and pre-supplementation (onset of experiment),* ***EPS:*** *post-exercise and pre-supplementation (after first time exercise and before supplementation),* ***ES:*** *post-exercise and post-supplementation (after first time exercise and 30day probiotic/ or starch capsule supplementation),* ***ESE:*** *post- supplementation and post-exercise (after 30day probiotic/ or starch capsule supplementation and after second time exercise).*[2]*Significant difference between means shown by different letters: a, and b.* [3]*Significant error of means.*

Table3.Lipidemic indices; Serum TC, triglyceride, and HDL-C level of probiotic (femilac)-supplemented athletes during 4 steps of experimental procedure

Treatments[1]	TC(mg/dl)				Triglyceride(mg/dl)				HDL-C(mg/dl)			
	PEPS	EPS	ES	ESE	PEPS	EPS	ES	ESE	PEPS	EPS	ES	ESE
Control (placebo)	186.2	196.7	202.7 [a]	196.5 [a]	149.7	240.5[a]	236.5[a]	252.2[a]	49.87	56.88	50.50	56.00
Probiotic (femilac supplemented)	168.7	191.0	165.2 [b]	170.5 [b]	142.7	157.5[b]	153.5[b]	154.5[b]	59.37	55.13	49.87	57.50
P value[2]	0.523	0.200	<.0001	0.0008	0.793	<.0001	<.0001	<.0001	0.188	0.877	0.330	0.441
SEM[3]	18.272	17.588	1.493	3.000	7.991	1.979	0.816	1.955	4.529	7.640	2.923	3.289

*[1] **PEPS:** pre-exercise and pre-supplementation (onset of experiment), **EPS:** post-exercise and pre-supplementation (after first time exercise and before supplementation), **ES:** post-exercise and post-supplementation (after first time exercise and 30day probiotic/ or starch capsule supplementation), **ESE:** post-supplementation and post-exercise (after 30day probiotic/ or starch capsule supplementation and after second time exercise).[2]Significant difference between means shown by different letters: a, and b. [3]Significant error of means.*

In present study, with exception to minor reduction in post-exercise glucose level, the probiotic supplementation and exercise protocol didn't cause significant change in glycemic status of athletes (table2), whereas in diabetic (Al-Salami et al., 2008) condition the probiotic supplementation may cause hyperglycemia. Present findings about possible effect of probiotic supplementation on glycemic status (table2) are in agreement with Ivey et al., (2014) who stated that probiotics didn't have benefit in short-term glycemic control.

TC and triglyceridein probiotics supplemented group is decreased following training and probiotic supplementation (table 3), present findings is in according to Stancu et al., (2008) who reported sever decline in TC and triglyceride level in animal model, following 6wk probiotic supplementation. Whereas in pre-diabetes condition, Mahboobi et al., (2014) had stated that probiotics did not have significant effects on lipid markers. It seems that probiotics may have different effect on lipid markers in healthy/ athletic and clinical/ diabetic condition.

In conclusion, probiotic supplementation along with exercise protocol (trained-individual) may have considerable hypolipidemic effect via decreasing total cholesterol and triglyceride, whereas didn't have considerable effect on glucose and insulin level in trained athletes. It can be suggested, the possible effect of probiotic on glycemic status is differed in athletic and clinical condition.

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