Biomedical Research 2017; 28 (21): 9475-9480 *ISSN 0970-938X*
www.biomedres.info

Effects of traditional fermented beverages on some blood parameters in aerobic exercises.

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Abstract

Containing probiotic microorganisms, fermented products have biological functions such as health promoting benefits, preservation of perishable foods, enrichment of nutritional value, production of antioxidants, therapeutic factors and immunological effects. The potential availability of fermented products as ergogenic aids to improve performance, to speed up recovery or to treat muscle damage that occurs during exercise is a subject which evokes discussion. Within this context, this study investigated the effects of kefir and boza beverages on blood values of exercisers. The study was conducted with 36 participants aged 18-25 years. Study group is composed of male individuals who do not engage in regular physical activity and have no chronic diseases. 36 volunteer participants were randomly assigned into three groups. Volunteers in Group 1 (n:12) performed a 1 h aerobic exercise session for 15 days without making any changes in their daily practices and habits. Volunteers in Group 2 also participated in a 1 h aerobic exercise session and consumed 300 ml boza, which is a fermented beverage, every day. Volunteers in Group 3 participated in the same exercise session and consumed 300 ml kefir every day. Blood samples were taken before and after the study to carry out the intended measurements. A Kruskal-Wallis test was performed for comparison between groups and a Wilcoxon Signed Ranks test was used to compare each group. The analysis of pre-test and post-test values of kefir group reveals statistically significant results in ALT (p=0.047) and TOS (p=0.017) values. The analysis of pre-test and post-test values of boza group reveals statistically significant results in Triglyceride (p=0.017), VLDL (p=0.017), Cl (p=0.021) and Creatine (p=0.025) values (p<0.05). However, the analysis of pre-test and post-test values of the control group shows no statistically significant results in blood parameters (p>0.05). Based on the positive effects of fermented beverages on aerobic exercise, we suggest that natural products be preferred over chemical products or performance enhancing drugs in future exercise sessions

Keywords: Fermented beverages, Kefir, Boza, Blood parameters, Aerobic exercise.

Accepted on December 18, 2017

Introduction

In recent years, the use of a variety of powder products, drugs and beverages under the name of food supplements has been on the increase on the premise that they help weight loss, improve muscular strength, endurance and physical performance, and keep full longer. The proliferation of websites that sell these food supplements is a case in point. Given handmade beverages naturally producing the same effects as artificial supplements, this study aimed to investigate the effects of some fermented products on blood values during exercise.

According to numerous studies, aerobic exercise leads to a decrease in blood lipid-LDL, cholesterol and triglyceride levels [1-4] while excessive physical exercise damages the immune system, elicits overtraining syndromes and increases the risk of contracting infectious diseases after training camps [5]. The function of substances or nutrients commonly used as ergogenic aids is to facilitate the adaptation of the body to stress caused by training. Regarded as effective on some conditioning properties, various nutrients are used as ergogenic aids.

Fermentation is one of the oldest and most cost-effective food production and preservation methods that have been in use for centuries [6]. Milk, which is one of the primary sources of

nutrition, is processed in various forms and transformed into commonly consumed dairy products. Nowadays, fermented milk beverages are produced in the traditional way all over the world. However, with urbanization, the development of consumer awareness, and the growing trend towards the consumption of probiotic and functional foods, dairy companies have realized the huge market potential of these dairy products and started to produce and market them. Consequently, there are various products as traditional and industrial fermented milk beverages on the shelves of supermarkets today.

Containing probiotic microorganisms, fermented products have biological functions such as health promoting benefits, preservation of perishable foods, enrichment of nutritional value, production of antioxidants, therapeutic factors and immunological effects. The common characteristics of these beverages are that they have a completely different flavour, aroma and refreshing effect from their raw materials. In Turkey and in many other countries, there is a wide variety of milk and dairy products depending on the differences in fermentation techniques and production styles. These products are urt, cheese, butter, ayran, ice cream, kefir, kumis, yakult, shubat, irkit, katyk and koiyrtpak [7].

Kefir is a fermented dairy beverage made from cow, sheep or goat milk. Kefir is produced by fermenting milk with grains of kefir, which is essentially a polysaccharide structure. Kefir has been shown to have positive effects on health when consumed daily and regularly. Moreover, according to Anonymous [8], Russian physicians used kefir to treat tuberculosis in the 1990s.

Kumis is a fermented dairy product made from mare's milk. According to the Central Asian Turks, kumis is a natural medicine for old age, dementia and many other diseases. Not only kumis and kefir, which already have very limited production opportunities, but other fermented dairy beverages should also be studied in order to promote and increase their production in Turkey because overall interest in these products is growing rapidly due to their nutritional values, protective and even therapeutic properties.

Some sources claim that boza making was known since ancient Egyptian times while some other sources state that it is a traditional fermented Turkish beverage [9]. Boza is a little or highly viscous beverage produced by grinding cereals such as corn, barley, rye, rice or millet, boiling it in water, adding sugar and then subjecting it to alcohol and lactic acid fermentations [10,11].

The aim of this study is to investigate the effects of kefir and boza beverages on blood values of exercisers.

Materials and Methods

The study was carried out with 36 participants aged 18-25 years. The study group consists of male individuals who do not engage in regular physical activity and have no chronic diseases. Protocols in parallel with the literature were applied for the research. Fasting blood samples were collected at the morning one day before training session and at the morning one day later training session to measure some biochemical and haematological parameters. Blood samples was analysed two hours after intake by expert biochemist. 36 volunteer participants were randomly assigned into three groups. Ethical approval was obtained from local Ethical Committee.

Volunteers in Group 1 (n:12) performed a 1 h aerobic exercise session for 15 days without making any changes in their daily practices and habits. Volunteers in Group 2 also participated in a 1 h aerobic exercise session and consumed 300-ml boza (a Brand Approved by the Ministry of Agriculture: Vefa Bozacısı Bozası) every day one time 30 min before exercise. Volunteers in Group 3 participated in the same exercise session and consumed 300 ml kefir (a Brand Approved by the Ministry of Agriculture: Atatürk Orman Çiftliği; Barcode: 8690115940180) every day one time 30 min before exercise. Blood samples were taken from the volunteers one day before and one day after the training session.

Blood collection procedures were carried out in the Biochemistry Laboratory of Afyon Kocatepe University. Serum Total Cholesterol, triglyceride, HDL, LDL, VLDL, AST, ALT, Total Protein Amylase, GGT, Uric acid, Creatine, Na, K, Cl and glucose levels were analyzed.

Serum biochemical measurements

Serum Total Cholesterol, triglyceride, HDL, LDL, VLDL, AST, ALT, Total Protein Albumin, Amylase, GGT, Glucose, Creatine, Uric acid, Sodium (Na), Potassium (K) and Chlorine levels were measured using commercial kits (Roche) on Roche Cobas C501 autoanalyzer (Roche Diagnostics International Ltd., Rotkreuz, Switzerland). Results were expressed as mg/dL for Total Cholesterol, Triglyceride, HDL, LDL, VLDL, Glucose, Creatinine and Uric acid, as U/L for AST, ALT, Amylase and GGT, as g/dl for Total protein and Albumin, and as mEq/L for Sodium, Potassium and Chlorine.

Measurement of serum TAS levels

Serum TAS measurement was performed using a Total Antioxidant Status Assay kit (Rel Assay Diagnostics, Mega Tıp Industry and Trade Co. Ltd., Sahinbey/Gaziantep/ TURKEY). Absorbance readings were taken using an ELISA reader (ChemWell 2910, Awareness Technology, Inc. Martin Hwy. Palm City, USA). Results were expressed as mmolTrolox Equiv./L.

Measurement of serum TOS levels

Serum TOS measurement was performed using a Total Antioxidant Status Assay kit (Rel Assay Diagnostics, Mega Tıp Industry and Trade Co. Ltd., Sahinbey/Gaziantep/ TURKEY). Absorbance readings were taken using an ELISA reader (ChemWell 2910, Awareness Technology, Inc. Martin Hwy. Palm City, USA). Results were expressed as μmol H_2O_2 Equiv./L.

Data were statistically analysed using the SPSS, version 20.0. Since the number of observations in each group was too low to satisfy parametric test assumptions, non-parametric tests were performed. A Kruskal-Wallis test was performed for comparisons between groups. A Wilcoxon Signed Ranks test was conducted to compare "before" and "after" values of each group.

Results

The analysis of pre-test and post-test values of kefir group revealed statistically significant results in ALT (p=0.047) and TOS (p=0.017) values (p<0.05). However, the analysis yielded no statistically significant results in other blood parameters (p>0.05) (Table 1).

Table 1. *Statistical analysis of pre-test and post-test values of kefir group, *p<0.05.*

Parameter	Test	X	SD	p
Amylase	Pre-test	66.40	24.74	0.953
	Post-test	65.80	21.03	
GGT	Pre-test	19.00	9.24	0.439
	Post-test	15.90	3.07	
Total Cholesterol	Pre-test	178.94	33.52	0.919
	Post-test	173.69	34.88	
Triglyceride	Pre-test	146.21	72.12	0.799
	Post-test	136.11	55.59	
HDL	Pre-test	49.87	10.22	0.799
	Post-test	50.94	9.73	
LDL	Pre-test	107.55	29.28	0.959
	Post-test	106.58	33.40	
VLDL	Pre-test	29.24	14.42	0.799
	Post-test	27.22	11.11	
Na	Pre-test	140.90	2.07	0.436
	Post-test	140.40	1.89	
K	Pre-test	4.95	0.45	0.359
	Post-test	5.08	0.58	
Cl	Pre-test	101.31	1.98	0.260
	Post-test	102.39	1.92	
Glucose	Pre-test	85.36	11.10	0.507
	Post-test	81.88	4.89	
Creatine	Pre-test	0.82	0.21	0.262
	Post-test	1.04	0.30	
Total Protein	Pre-test	7.25	0.34	0.324
	Post-test	7.15	0.34	
Albumin	Pre-test	4.81	0.30	0.959
	Post-test	4.77	0.24	
AST	Pre-test	22.40	6.88	0.959
	Post-test	23.17	7.94	
ALT	Pre-test	23.43	7.60	0.047*
	Post-test	10.44	21.70	
Uric acid	Pre-test	6.38	0.66	0.959
	Post-test	6.35	1.00	
TAS	Pre-test	0.95	0.12	0.092
	Post-test	1.02	0.12	
TOS	Pre-test	14.52	12.18	0.017*

The analysis of pre-test and post-test values of boza group revealed statistically significant differences in Triglyceride (p=0.017), VLDL (p=0.017), Cl (p=0.021), Creatine (p=0.025) values (p<0.05) while the analysis yielded no statistically significant differences in other blood parameters (p>0.05) (Table 2).

Table 2. *Statistical analysis of pre-test and post-test values of boza group, *p<0.05.*

Parameter	Test	X	SD	p
Amylase	Pre-test	65.62	21.25	1.000
	Post-test	65.62	17.09	
GGT	Pre-test	19.37	8.61	0.351
	Post-test	17.00	5.50	
Total Cholesterol	Pre-test	174.14	32.98	0.779
	Post-test	170.31	39.28	
Triglyceride	Pre-test	130.91	33.30	0.017*
	Post-test	96.57	15.94	
HDL	Pre-test	48.66	16.16	1.000
	Post-test	52.26	13.77	
LDL	Pre-test	99.83	31.01	0.889
	Post-test	103.85	40.60	
VLDL	Pre-test	26.18	6.66	0.017*
	Post-test	19.31	3.18	
Na	Pre-test	140.00	3.16	0.574
	Post-test	141.00	2.50	
K	Pre-test	4.89	0.32	0.674
	Post-test	4.93	0.28	
Cl	Pre-test	100.80	1.36	0.021*
	Post-test	103.05	1.04	
Glucose	Pre-test	85.27	10.53	0.889

	Post-test	88.17	20.93	
Creatine	Pre-test	0.57	0.12	0.025*
	Post-test	0.92	0.37	
Total Protein	Pre-test	7.32	0.34	0.348
	Post-test	7.18	0.34	
Albumin	Pre-test	5.04	0.27	0.123
	Post-test	4.81	0.33	
AST	Pre-test	26.92	13.34	0.499
	Post-test	30.00	12.96	
ALT	Pre-test	19.50	13.00	0.123
	Post-test	12.27	5.61	
Uric acid	Pre-test	5.83	1.02	0.944
	Post-test	5.84	1.00	
TAS	Pre-test	0.89	0.13	0.889
	Post-test	0.91	0.21	
TOS	Pre-test	12.94	11.55	0.327

The analysis of pre-test and post-test values of control group revealed no statistically significant differences in blood parameters ($p>0.05$) (Table 3).

Table 3. *Statistical analysis of pre-test and post-test values of control group.*

Parameter	Test	X	SD	p
Amylase	Pre-test	75.77	19.97	0.374
	Post-test	79.27	18.29	
GGT	Pre-test	16.33	5.95	0.725
	Post-test	17.63	6.94	
Total Cholesterol	Pre-test	180.83	15.99	0.374
	Post-test	177.21	16.43	
Triglyceride	Pre-test	105.84	27.32	0.678
	Post-test	121.39	39.76	
HDL	Pre-test	59.37	11.79	0.343
	Post-test	55.96	11.38	
LDL	Pre-test	104.07	17.40	0.953
	Post-test	101.37	12.49	
VLDL	Pre-test	21.16	5.46	0.678
	Post-test	24.27	7.95	
Na	Pre-test	139.88	3.55	0.677
	Post-test	139.72	2.00	
K	Pre-test	4.97	0.38	0.813
	Post-test	4.95	0.36	
Cl	Pre-test	101.21	1.54	0.398
	Post-test	102.33	2.62	
Glucose	Pre-test	81.61	6.41	0.213
	Post-test	88.45	14.05	
Creatine	Pre-test	0.64	0.17	0.139
	Post-test	0.85	0.22	
Total Protein	Pre-test	7.33	0.18	0.123
	Post-test	7.07	0.37	
Albumin	Pre-test	4.93	0.38	0.515
	Post-test	4.87	0.24	
AST	Pre-test	25.68	10.00	0.859
	Post-test	27.18	9.77	
ALT	Pre-test	25.41	23.91	0.139
	Post-test	13.64	6.15	
Uric acid	Pre-test	6.33	1.26	0.314
	Post-test	5.86	0.86	
TAS	Pre-test	0.95	0.28	0.906
	Post-test	0.90	0.12	
TOS	Pre-test	14.69	8.94	0.280
	Post-test	7.03	5.32	

Discussion

The results indicate that the consumption of kefir and boza beverages as ergogenic aids during aerobic exercises leads to differences in some blood parameters in individuals. The consumption of kefir during aerobic exercises leads to a decrease in ALT (alanine aminotransferase) levels. The levels of ALT enzyme produced in various organs and tissues in the body help to make or exclude the diagnoses of some diseases. ALT enzyme mostly informs about any type of liver cell injury. ALT, which is a test for liver functions, not only varies in liver diseases but also in different diseases in tissues and organs. ALT levels range from 10 to 40 U/L in men. Mean pre-test ALT level of the volunteers in this study was 23.43 U/L. Mean ALT level of the volunteers decreased significantly to 10.44 U/L with a 1-hour aerobic exercise and consumption of 300-ml boza for 15 days. High ALT levels are observed in acute conditions, such as occlusion of bile ducts and carbon tetrachloride exposure as well as in hepatitis and cirrhosis, which can be characterized by liver functions [12-14].

Johnson et al. [15] reported that a four-week aerobic exercise did not cause any change in ALT levels despite causing some changes in blood parameters in obese individuals. Similarly, there was no change in ALT levels of the volunteers in the control group of this study. Baba et al. [16] reported that a 3-month aerobic exercise caused a statistically significant decrease in ALT levels of hepatitis-diagnosed individuals. In another study on patients with obesity and liver dysfunction, a

15-month exercise and diet resulted in a significant decrease in ALT levels [17]. In this study, kefir consumption and aerobic exercise for only two weeks resulted in a significant decrease in ALT levels. It can, therefore, be suggested that kefir consumption during aerobic exercise accelerates the attainment of desired ALT levels.

Another important result from the analysis of the pre-test and post-test values of the kefir group is the significant decrease in TOS (Total Oxidant Status), which is an indicator of oxidative stress. The general view in the literature is that exercise increases TOS levels in parallel with oxidative stress [18-20]. However, the results of this study show that kefir consumption during aerobic exercise resulted in a significant decrease in TOS levels, indicating that kefir consumption during exercise can reduce or even eliminate the adverse effects of exercise on TOS levels, which are indicators of oxidative stress. Consequently, consuming kefir during exercise can be suggested for the elimination of the oxidative stress that accompanies exercise.

The results showed a decrease in the pre-test and post-test triglyceride and VLDL (very low-density lipoprotein) levels of the volunteers in the boza group while no significant change was observed in the control group. Studies on triglyceride and VLDL levels in the literature show that athletes have lower triglyceride and higher VLDL levels than sedentary individuals [21], individuals who exercise for long periods of time have reduced triglyceride levels and higher VLDL levels [22], there are no significant changes in triglyceride and VLDL levels of athletes during competition periods [23], and short-term intense exercise does not cause a change in triglyceride values but leads to an increase in VLDL levels [24]. The decrease in triglyceride and VLDL levels of the volunteers in the boza group shows the importance of boza consumption during aerobic exercise for the improvement of body fat and bad cholesterol levels.

Another important result from the statistical analysis of the pre-test and post-test values of the boza group is the significant increase in Cl (chlorine) and creatine levels. Iriadam et al. [25] reported that exercise did not cause a change in Cl levels, however, led to a significant decrease in creatine levels. Creatine plays a significant role especially in muscle contraction. Therefore, the significant increase in creatine levels in the boza group is an important result in terms of continuation of exercise and shortening of recovery time after exercise.

Conclusion

In conclusion, the consumption of kefir and boza beverages during exercise causes significant and positive changes in blood parameters compared to exercise sessions with no supplement use. Positive changes in blood parameters support the usefulness of these traditional fermented beverages especially during aerobic exercise. It is recommended that further studies examine the effect of these fermented beverages together with different exercise sessions on athletes of different gender, age, sports type and training conditions.

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