THE INFLUENCE OF VIBRATION TRAINING ON BLOOD CHOLESTEROL IN PEOPLE WITH OSTEOPOROSIS RISK

by

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The main aim of the experiment was description of low frequency influence on cholesterol (LDL and HDL fractions) in people with osteoporosis risk. Subjects were divided into two groups: experimental including 12 subjects which performed 15 min. long training sessions during 19 day schedule and 12 subjects in control one. Training consisted with low frequency vibrations (3.5 Hz) on special platform. Before and after experiment the venous blood was taken in order to establish cholesterol concentration (HDL and LDL fractions). It was determined that concentration of whole cholesterol and its HDL and LDL fractions was increased after experiment. Changes were significantly larger in experimental group. Because of negative consequences of increase in ischemic factors the results of this pilot study should be confirmed in further experiments.

Key words: low frequency vibrations, osteoporosis, cholesterol

Introduction

The contemporary growth of civilization diseases (osteoporosis, obesity, cardio-pulmonary problems etc.) caused great increase in efforts to find out new methods nivelating negative changes in human health. More often the methods with the use of physical stimuli magnetic field, laser techniques) are taken into account. Existing experimental data do not determine the influence of above mentioned stimuli to blood cholesterol and its HDL and LDL fractions. The data presented in literature do not describe the influence of another physical stimuli i.e. low frequency vibration on osseous and muscle

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system as well as lipid fractions (lipid metabolism). It is only know that low frequency vibrations activate muscle activity (Engel 1993), so they may imitate training.

Simultaneously it may be expected, that these vibration may cause human body metabolism recovery through energetic processes regulation and immunity increase. Properly set vibration frequency may imitate physical activity, especially in subjects with limited activity from healthy reasons. The general vibration probably may be used in bone fractures and coronary diseases (Damian et al. 2002). There is no experimental data performed in humans describing the influence of low frequency vibrations on lipid fraction. The only one work present data from Wistar rats experiment so cannot be transformed fully to human beings (Damian et al. 2002).

Material and methods

The experiment was conducted on 24 subjects aged from 39 to 55 years demonstrating low or at least medium physical activity from the healthy reasons, especially with osseous system. The experimental group (n=12) performed 19-days long training schedule on vibration platform (15 min. per day). The frequency was similar to slow human run frequency (3.5 Hz). All subjects needed rehabilitation treatment because of osteoporosis. All subjects were characterized with normal EKG record and were free from cardio-pulmonary problems. Before and after training the basic body parameters were registered including blood pressure and body temperature. Before and two days after experiment following biochemical markers were tested in venous blood:

- whole cholesterol concentration (Biochemtest enzymatic method),
- HDL fraction and LDL cholesterol fractions (Biochemtest test).

The acquired results were analyzed statistically including mean values, standard deviations and t-Student test for dependent variables.

Results

The mean values and standard deviations of analyzed variables are presented in table 1 and fig. 1-3.

Table 1. Mean values and standard deviations of analyzed variables in tested groups

Variable	Experimental (n=12)		Control (n=12)	
	Before	After	Before	After
Total cholesterol [g/dl]	248±40	306,5±39,7	319,5±62,93	339±55,15
HDL fraction [g/dl]	41,55±3,02	35,42±14,62	37,03±1,88	41,88±7,91
LDL fraction [g/dl]	206,7±15,39	271,15±16,45	293,88±61,04	297,25±47

The tendency to increase the concentration of total cholesterol was observed in both groups. In experimental group increase in level of analyzed cholesterol lower than in control group and increased significantly after experiment. The increase of total cholesterol was significantly greater in experimental than in control group which did not realized the vibration training schedule. It ma be also stated that the level of all concentration was higher than physiological norm which is determined as 200 g/dl.

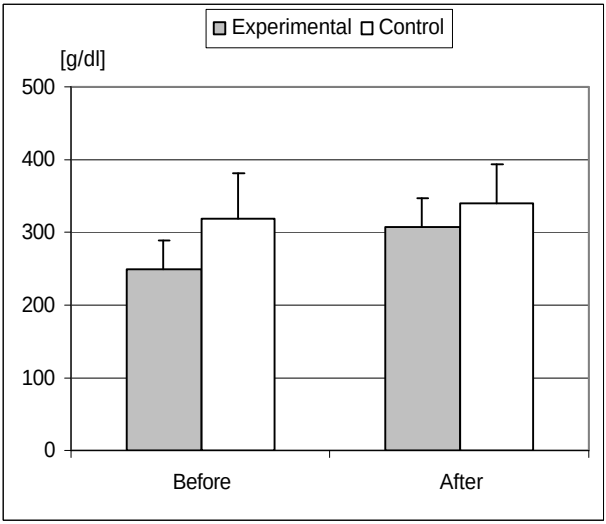

Fig. 1. The level of total cholesterol in tested groups

The mean values of HDL fraction cholesterol level are higher after experiment. After 19 days of training schedule the level of analyzed variables increased from 41.5 to 50.0 g/dl which is also equal to physiological norm. In control group similar tendency was observed. Mean values of this variable were respectively: 48.5 g/dl and 49.5 g/dl before and after experiment. Both values fit into range of physiological norm.

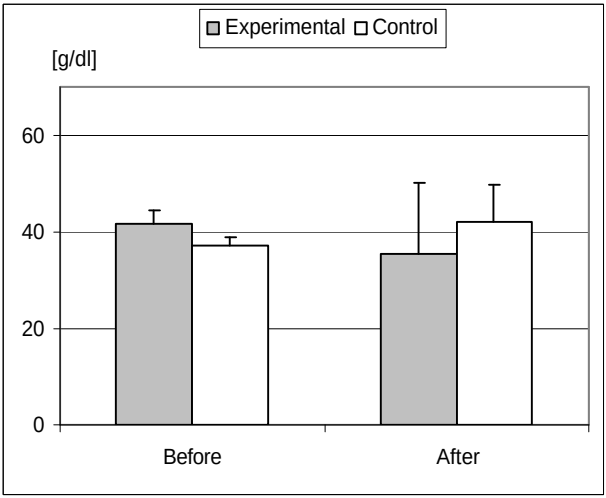

Fig. 2. The level of HDL cholesterol fraction in tested groups

It seems that training on the vibration platform caused largest changes in the level of LDL cholesterol fraction. All subjects showed higher than physiological norm values. Mean level of HDL before experiment was equal 196.5 g/dl and 256.5 g/dl after experiment. This fact leads to conclusion that low frequency vibration training causes transition HDL and LDL fractions and increase in LDL concentration. In subjects from control group small increase in LDL cholesterol fraction was registered. Mean value before experiment equaled 270 g/dl, and after 3 weeks 289.5g/dl. Both values are higher than physiological norms.

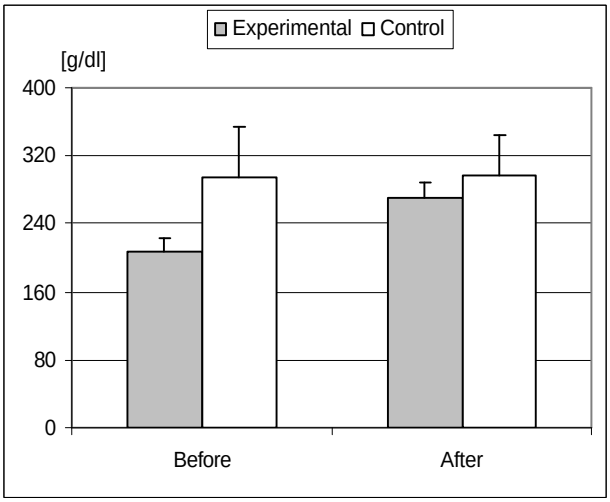

Fig. 3. The level of LDL cholesterol fraction in tested groups

Discussion

Growing attention was paid during last years to research about total cholesterol and its fractions (HDL and LDL) because of influence on human body as myocardial ischemia risk factor. According to Castelli (1990) there is strong relation between the level of total cholesterol and incidence of myocardial ischemia. This author states also that LDL cholesterol fraction show similar relation, while HDL fraction reverse. This data were confirmed by Hammerschmidt (1994)

Presented in this paper data showed higher increase in level of cholesterol in experimental group (by 57.5 g/dl) than in control one (19.5 g/dl). Having in mind that experiment was conducted in August and September (diet change) may suggest that vibration training caused increase in total cholesterol concentration. Acquired results do not confirm the results from animal experiments where reverse occurrence was determined i.e. the decrement in total cholesterol after low frequency vibration exposure (Damian et al. 2002). However in unpublished data from own experiment similar tendency was registered. Similar data were acquired also in students after Finnish sauna training (Pilch 1994).

The HDL cholesterol fraction increased in both groups, but significantly higher level was registered in experimental group than in control (8.5 g/dl and 1 g/dl respectively). It should be remembered that also total cholesterol concentration was increased significantly in experimental group. Similar increase of HDL cholesterol fraction was registered in research with sauna treatment (Pilch 1994).

In both groups the level of LDL cholesterol fraction concentration increased and once again in higher degree in experimental group than in control (60 g/dl and 19.5 g/dl respectively). Reversed effect was registered by Pilch (1994) so it may be stated that sauna treatment contrary to low frequency vibrations causes cholesterol fraction transition in respect to HDL.

It is difficult to answer the question if low frequency vibrations have influence on human body. This problem is of course more complex because the lipid metabolism is regulated by hormones and metabolic changes (increase in carbohydrates metabolism inhibits lipid metabolism etc.). Undoubtedly the further experiments confirming such an occurrence should assumed low frequency vibrations as insufficient.

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