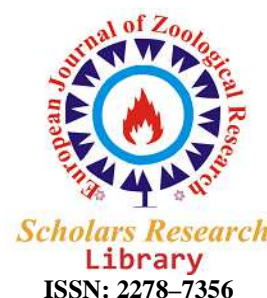




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Effect of endurance training, speed training and vitamin E supplement on adhesion molecules in rat, mice, men and women

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ABSTRACT

Many studies in humans and animals have shown that adhesion between cells, and the cells and proteins of the adhesive molecules caused in health and disease is important. Today, a significant positive correlation between plasma concentration factor, ICAM-1, vascular inflammation and obesity, particularly central obesity and blood triglycerides, and negatively with HDL-C concentrations in plasma, has been identified. American College of Sports Medicine and the Center for Disease Control and Prevention, in the same report at least 30 minutes of moderate-intensity physical activity, preferably all, days of the week is recommended for good health. So, the purpose of the present study was investigation of effect of endurance training, speed training and vitamin E on adhesion molecules in rat, mice, men and women.

Keywords: Rat, Mice, Endurance training, Speed training, Vitamin E supplement.

INTRODUCTION

In recent years, with increasing levels of social welfare in developing countries, the age range of heart disease-cardiovascular and muscular-skeletal dramatically declined [1]. Nowadays corner vascular insufficiency, as one of the most important diseases in industrialized societies and modern times, has been introduced [2]. Basically, inflammation, often source device-related diseases, cardiovascular. The stimulation of vascular injury, thus taking some drugs in some cases, directly and indirectly, such as shear stress increases, causing increased sensitivity of vascular endothelial adhesion molecules such as VCAM-1 and ICAM-1 [3].

Many studies in humans and animals have shown that adhesion between cells, and the cells and proteins of the adhesive molecules caused in health and disease is important [4,5]. Now know the healthy function of adhesive molecules in processes such as embryonic development, differentiation, apoptosis, angiogenesis of wound healing, inflammation and vascular development and coordination is essential. Defects in cell adhesion molecules in action, the main cause of the pathological development of many diseases such as cancer, immune deficiency and heart disease - vascular [6].

Today, a significant positive correlation between plasma concentration factor, ICAM-1, vascular inflammation and obesity, particularly central obesity and blood triglycerides, and negatively with HDL-C concentrations in plasma, has been identified [7]. In recent years, the impact of environmental interventions such as diet, weight loss and

exercise on vascular inflammatory factors, researchers have noted [8,9,10,11]. However, the effects of exercise on these factors in a wide range of sports activities were reported [9,12].

Physical activity, several free radical-producing systems in the body cells activates the two main sources (electron leakage from mitochondria during aerobic respiration and NADPH oxidation) [13] and secondary (monocytes immune cells and lymphocytes, platelets) are divided [14]. Free radicals cause membrane lipid peroxidation, damage cell proteins and genetic structures of cells are affected [13,14]. It is also shown that exercise-induced oxidative stress causes endothelial cell activation and expression of cell adhesion molecules is a ICAM-1 [15,16].

Cell adhesion molecules exist in two forms, membrane-bound and soluble [17,18]. Cell adhesion molecule binds to a membrane protein of 90 kDa mICAM-1 glycoprotein's is often expressed on the surface of endothelial cells [18]. Cell adhesion molecules as membrane-bound receptors for immune cells, especially leukocytes act [19]. The soluble cell adhesion molecules sICAM-1 by proteolysis of endothelial cells were isolated and circulating cell adhesion molecules are released compared to about 7 kDa membrane-bound low molecular weight [18]. Represents a soluble form of ICAM-1 expression on endothelial cells and expression of great clinical indicators of inflammation and activation of endothelial cells [20].

American college of sports medicine and the center for disease control and prevention, in the same report at least 30 minutes of moderate-intensity physical activity, preferably all, days of the week is recommended for good health [21]. In recent years the use of determinants of endothelial work for nomination of training programs on various data models have been identified [7,22,23]. Sabartier et al 2008, after 14 weeks of aerobic exercise for 50 minutes (two minutes each session includes Tvathay intense aerobic activity 90-75% and 65-55% heart rate reserve) in 13 healthy non-significant changes in VCAM-1 and ICAM -1 were reported in plasma [24].

The acute effects of exercise, Simpson et al (2006) effects of moderate intensity exercise (60% VO₂max), severe (80% VO₂max) and running downhill with a slope of 10% and 80% VO₂max on ICAM-1 levels studied and found ICAM01 values after intensive training and running fast downhill increases and expressed increased lymphocyte traffic during exercise increases the adhesion molecules are sticky. It also noted that this exercise is strongly influenced by events, not muscle injury [6].

Rankovic et al (2009) study on patients with mild heart failure, cardiac rehabilitation program after running a six-week low intensity does not change significantly with ICAM-1 number of leukocytes and were reported [25]. Saxton et al (2008) Effects of low-intensity cycling with arms and legs 24 weeks, 25% saw a reduction in vascular adhesion molecule [26]. Witkowska (2005) in his review of research on the effects of regular moderate to high activity, changes in adhesion molecules, molecules are stressed [11].

Sixt et al (2010) and Puglisi et al (2008), respectively, after 4 weeks of training, supervised exercise (6 sets of 15 minutes of cycling at 80% maximum heart rate for a period of 5 days per week) and after 6 weeks of walking (2 weeks 10 accurate, two the second week, 20 minutes and 2 third week, 30 minutes a day) in patients with arthritis, coronary heart disease in men and women 50 to 70 years and decreased levels of ICAM-1 levels were reported [15,16].

Research the background of the exercises, endurance, speed and vitamin E supplementation and changes in the levels of adhesion molecules are created?

Now, the number of, research that has been done, we will:

Research in mice by Soori et al (2011), in particular, to examine the impact of exercise on vascular cell adhesion molecules levels in overweight middle-aged women, were 20 obese sedentary women, selected randomly, the Group exercise and control groups. Training program for the experimental group consisted of running on a treadmill for 50 to 60 minutes, 5 times a week, with intensity equal to 7 Matt was administered for 8 weeks, and lifestyle control group showed no change. Firstly bloodletting, after 12 hours of fasting and 48 hours after exercise were conducted under experimental conditions. Paired t test to assess differences between groups in mean changes before and after the t-test at a significance level ($P < 0.05$) for nomination significant variations between groups was used. T-test results of the pretest variables showed no significant differences between groups. ($P > 0.05$). Serum levels of ICAM-1 in the experimental group decreased by 18% after 8 weeks ($P < 0.05$). VCAM-1 was reduced to 8%, but not

significant ($P>0.05$). Weight, BMI and body fat percentage of the subjects, respectively, 4/6, 6/2 and a 10% decrease ($P<0.01$). Between changes in body fat changes with ICAM-1 ($R=0.62$, $P=0.01$) there was a significant relationship [27].

In another study by Mogharnasi et al (2008), in particular, sprint training and detraining effects on sICAM-1 levels and a new inflammatory marker and predictor of heart disease - cardiovascular, took place, for this purpose, 42 male, 3 months old, wistar, randomly assigned to two experimental groups ($n=24$), and controls ($n=18$) were included. Training program for 12 weeks, 3 sessions per week, with specific intensity and duration (85 to 100% and over 100% of VO_{2max}) was performed. After the 24th session, 6 rats in this group of subjects without training experience will also be studied effects of detraining. Phlebotomy training after 14 hours of fasting at different stages of the same condition Wu sICAM-1 levels was measured using ELISA kits. Data were analyzed using the Smirnov-Kolmogorov test, repeated measures, and post hoc LSD test and t-test were analyzed. Results showed that sICAM-1 levels in the first 24 sessions of training were not significantly increased ($P=0.004$). So, determined to stop the practice of extreme speed, sICAM-1 levels are significantly reduced ($P=0.0152$). While training and detraining in the comparison group, these changes were significant ($P=0.024$) [28].

In another study by Soori and Salehiyan (2010), in particular, the effect of both low and intense endurance training program on changes in plasma cell adhesion molecules, as well as its relation to fat distribution and lipid profile were made to order, 27 the population of obese individuals in sedentary subjects were selected, and randomly assigned to three experimental groups. During the 4-month program of endurance exercise three times a week, each session lasting 60-45 minutes and 45-40 percent for the experimental group 1 and experimental group 2, intensity 85-80% heart rate reserve was implemented. Blood after 12 hours of fasting at the beginning and at the end of 48 hours after completion of the exercise was conducted under experimental conditions. Data celebrate the variance between the pre-test to post-hoc test, Ben IFN, Pearson correlation and paired t-test at a significance level of $P<0.05$ were analyzed. Research findings suggest that plasma ICAM-1 levels were decreased in both experimental groups, but only in the experimental group 2 was significant ($P=0.015$), on the other hand, changes in ICAM-1 in the experimental group 2. The control group was significant ($P=0.004$). Between initial levels of sICAM-1 with each of the physical variables and lipid profile relationship was not significant ($P> 0/05$). In relation to the total variation in the experimental group, with a total change in body composition variables between changes in body fat percentage ($R = 0/48$, $P = 0/012$) and fat weight ($R=0.44$, $P=0.022$) ICAM-1 concentrations were significantly correlated with the changes. Cholesterol, LDL-C and risk factors in the experimental group 2 was significantly decreased ($P<0.05$). A significant increase in HDL-C was seen only in intense group ($P=0.031$) [29].

In another study by Taheri Chadorneshin and Sehat (2011), the effect of supplemental vitamin E, a cell adhesion molecule response type, activity was exhaustive, therefore, an active man of 16 based on VO_{2max} , the supplement and placebo groups, respectively. After 14 days of supplementation, subjects in both groups 65 min did exhaustive work. Before the supplementation period, blood samples, taken before and immediately after exhaustive exercise. Data were analyzed using analysis of variance and t-test was used. Results A significant increase in serum vitamin E supplementation showed ($P=0.000$). Also, ICAM-1 levels in the supplement group ($P=0.128$) and placebo ($P=0.095$) were non-significant increase. However, the levels of both ICAM-1 and placebo groups at any time stage was no significant difference ($P=0.710$) [30].

DISCUSSION AND CONCLUSION

Findings indicate that serum levels of ICAM-1, after 8 weeks of exercise decreased by 18% ($P<0.05$). VCAM-1 was also reduced to 8%, but this value was not statistically significant ($P<0.05$). Basically, decreased serum levels of adhesion molecules carrying different results in long training sessions on research paper has been rejected. So that seems to be the principle of consistency observed in this study, the dose-response physical activity intensity, duration and frequency depends on the training sessions.

On the influence of gender on physiological responses induced by exercise Levi and mid-1995 recovery of exercise capacity induced by exercise in both sexes, significant differences reported [31]. In recent years the variability between the sexes in response to exercise-induced changes in arterial structure [32], automatic control of blood flow [25] is reported. Tarnopolsky (2008) research higher lipid oxidation capacity in endurance activities noted in women than in men due to the higher intracellular lipid content and lipolysis in adiposities as good [33]. With the research study, a similar lack of consensus on the impact of physical activity in women and men is identified. In some studies

did not find consistent and similar in women than men, reducing sooner Commons motivational women expressed [34], however, specific reason for the metabolic response than women to exercise listed [33,34]. Based on the results of this study are consistent or inconsistent with respect to this issue is under review. Zoppini et al (2006), after two sessions per week of moderate-intensity aerobic training after six months, significant changes were reported adhesion molecules [35]. In contrast Sabatier et al (2008), after 12 weeks of moderate intensity exercise failed to report a significant reduction in VCAM-1 levels [24].

Reduce the percentage of body fat is one of the major causes of loss of adhesive molecules. It is known that the release of inflammatory factors in reducing body fat and increasing lean tissue in response to inflammatory cytokine is inhibited [36].

Related changes in body fat levels were determined with an adhesive molecules, the Imam is not clear that this was more a result of which the agent (or reduced fat Exercise alone) is. However, significant beneficial changes in VCAM-1 levels may be more intense training is necessary. According to the findings, beneficial changes in body fat, weight and levels of cell adhesion molecules can be achieved by the implementation of the protocol, but to a definite conclusion, implementing further statistical sample or more highly recommended.

In the second study, the effect of 12 weeks of spring training, three sessions a week, and a lack of exercise, inflammatory Brshakhs sICAM-1, three months in wistar rats, was studied. Results showed that sICAM-1 levels in the control group, at various stages, gradually increased, and only three were significant steps in one session a week, which is likely, given that the control is disabled and only Food consumption has increased their weight by increasing fat mass and decreasing body mass is pure.

In this respect, Ziccardi et al point out that in 2002, received an imbalance between energy intake and weight gain occurs due to inactivity and obesity are associated with increased levels of proinflammatory cytokines (inflammatory mediators) and adhesion molecules sICAM-1 is a cell [37].

The group quickly with previous reports stating that strenuous physical activity is associated with baseline higher sICAM-1 is approved. Simpson et al (2006), Smith et al (2000) and Mastro et al (1999), reported levels of sICAM-1 after exercise, acute severe resistance, increases proposed exercise muscle damage or inflammation may be associated with increased plasma concentrations of sICAM-1 are [5,25, 38].

Mastro et al (1999) found heavy resistance training (weight lifting, climbing stairs) rats field of cell adhesion molecules ICAM-1 and L-selection into groups of nodes, thymus, and spleen will increase significantly and have stated exercise With the increase in cytokines IL-6, TNF- α increases the adhesive molecules are public defense system of the body will change during exercise [38].

Much evidence has shown the heart benefits of regular exercise-has known coronary heart disease prevalence - the prevalence of known coronary heart disease - healthy and diseased blood vessels in humans reduces the exercise a sharp increase in proinflammatory cytokines and the proinflammatory cytokines leading to increased gene expression and plasma levels of adhesion molecules in endothelial cells, leukocytes are monocytes increase reacts [5,25,38].

Nemet et al (2003 & 2004), showed that intensive training ship for boys and girls water polo, deep stimulation of the immune system and significant increases in proinflammatory cytokines and decreased anabolic mediator, is associated with and induces changes in white cell subsets blood cell adhesion molecules is a general change in the role of immune status and improve immune system and hormones regulating blood cells is unknown [39,40].

Part of the results of this study, the effect of 4 weeks of detraining, the inflammatory marker sICAM-1, are allotted, it became clear that the experimental group of 24 sessions, no training process until the end of the experiment group (no exercise), levels of sICAM-1, was associated with significantly reduced, and it was close to baseline values. In other words, after 4 weeks of detraining 24 sprints training sessions, intensive training to stop the inflammatory marker sICAM-1, declined.

Johnson et al (2003) concluded were short detraining period of significant change in the levels of sICAM-1 and sVCAM-1 did not cause. Drew Changes Their findings are consistent with the present experimental groups.

The third study showed that cholesterol levels ($P=0.007$) and HDL-C ($P=0.038$) after 16 weeks of high-intensity exercise significantly reduced. These values were significantly different from the control group ($P<0.05$). About the effects of exercise on cell adhesion molecules findings suggest that changes in plasma ICAM-1 levels decreased in the experimental group 2 (high intensity) is significant. Rankovic et al (2009) after a six-week cardiac rehabilitation program run low, no significant change in the number of leukocytes and ICAM-1 were reported in plasma [25].

But Saxton et al (2008), after 24 weeks of low-intensity cycling, reduction of vascular adhesion molecules were reported by 25% [26]. In this field, Adamopoulos et al (2001) following 12 weeks of exercise, five times a week Intensity 80-70% of maximum heart rate, decrease in concentration of approximately 200 ng ml ICAM-1 was observed in subjects [41]. Pontiroli et al (2004) after one year as 30 minutes of aerobic exercise daily, a significant decrease in the levels of ICAM-1 and E-selection were reported. According to them, the change in body weight is significantly associated with changes in ICAM-1 [42].

Goldhammer et al (2005), after 12 weeks of aerobic activity three times a week for 45 minutes per session with 70 to 80 percent of maximum heart rate, increased IL-10 and other cytokines were reported. IL-10 has been introduced as a suppressor of inflammatory cytokine production [43].

On the other hand, different mechanism as decreased levels of ICAM-1, in the long term training is reported that, according to ICAM-1 with respect to changes in waist circumference, possibly reduced obesity as one of the factors involved the reduction of ICAM-1 [44]. sICAM-1 in relation to fat distribution and lipid profile, Goto et al (2002), correlation between sICAM-1 plasma levels with obesity, particularly central obesity in women were reported [7]. In another study, a positive correlation was also negatively associated with HDL-C and triglycerides and sICAM-1, have been reported [45].

Although the experimental group, body fat decreased, but significant, beneficial changes in ICAM-1, the experimental group 2 (high intensity), it can be seen that, with regard to the relationship between changes in body fat percentage changes in the level of ICAM- 1, possibly reducing body fat percentage cannot be considered as the only factor affecting the community, and possibly other things that were a source of high-intensity exercise in experimental group 2, are involved in achieving such outcomes. Related changes in body fat percentage are specified in the parameters, but useful changes to the vessel wall, exercise should be carried out with greater intensity. Low-intensity endurance exercise can be used to maintain body weight and baseline levels of risk factors, but to take advantage of the benefits of more cells, intense endurance training should utilize.

Four of the most important findings are that the use of vitamin E, no significant differences in serum levels of ICAM-1 and placebo groups, on both occasions before and immediately after exhaustive exercise caused it. In this regard, Hodkova et al (2004) and Hoydonck et al (2006), respectively, with 5 weeks of vitamin E supplementation in chronic hemodialysis patients, and 4 weeks of vitamin C in smokers, compared with no change in serum levels of ICAM-1 placebo reported [46,47]. However, the results of the fourth study results Antoniadis et al (2003) and Dam et al (2003), is inconsistent [48,49]. Tahir et al (2005), after six months of supplementation of vitamin E, reduced ICAM-1 serum levels in patients with aortic stenosis were reported [50]. The subjects of their research, stating drugs, beta blockers, aspirin, inhibitors of enzymes degrading angiotensin on the basis of consumption, and as these drugs, by reducing the sensitivity of the oxidation of LDL, reduced levels of ICAM-1 levels are [50,51].

In general, researchers believe that the counter of the results may be due to differences in implementation research in cell culture [49,52], the difference in the type of pathological condition participants [52], use of vitamin C in combination with vitamin E [48] and the difference Taking vitamin E isomer is the [52]. ICAM-1 mean levels of serum supplementation before and immediately after exhaustive exercise compared to placebo slightly lower. In this study, the use of vitamin E, an antioxidant that has anti-inflammatory and regulations [49,50,52]. After intestinal absorption of vitamin E into the lymphatic system and bloodstream this way, then enter the cell to bind to the LDL receptor [14].

During exercise, free radicals are produced in abundance. Endothelial cells are constantly exposed to oxidants due to the location of superoxide and hydrogen peroxide producers in particular are extracellular sources [49]. Oxidants through the activation of endothelial cells increases production of inflammatory markers, particularly ICAM-1 are [18,49,51]. Vitamin E is one of the most accessible antioxidant nutritional [14,52], which Anti-inflammatory and

anti-oxidative double-standard due to reduced serum levels of ICAM-1. Vitamin E reduces the uptake of superoxide radical's monocytes binding to endothelial cells and endothelial cell activation is reduced [52].

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