

Effects of Vitamin C on Eosinophils after Sub-Maximal Physical Exercise in Students

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Abstract: *Oxidative stress due to submaximal physical exercise is a physiological process that can cause a decrease in immune function. Oxidative stress due to submaximal physical exercise results in increased susceptibility of a person to infection, which can reduce the degree of health. The purpose of this study was to determine the effect of vitamin C on the amount of eosinophils after physical exercise. This type of research is a quasi-experimental research with experimental design pre and post test group design. Research subjects were 20 students. Samples were taken by purposive sampling. The study was carried out at the Physical Laboratory of the Faculty of Sport Science UNIMED and the Regional Health Laboratory of North Sumatra Province to measure blood. There was a difference in the decrease in the average number of eosinophils, in the 2 groups, In group 1 namely the submaximal physical exercise group and placebo there was a greater decrease in the number of eosinophils compared to group 2 (42.10% vs 7.40%). This means that administration of vitamin C after submaximal physical exercise can prevent a decrease in immunity. Submaximal physical exercise combined with taking vitamin C can prevent a decrease in immunity because vitamin C acts as an antioxidant that can neutralize free radicals produced during submaximal physical exercise*

Keywords: submaximal physical exercise, eosinophil, vitamin C

1. Introduction

Physical exercise when done regularly and pleasantly and the right dosage with mild to moderate intensity has an immunomodulatory effect that affects the immune system and protects disease from cell damage so that it will improve health and fitness (Neil, 2011). Such aerobic physical exercise will improve and slow down the process of decreasing the function of body organs, and can increase the body's resistance to infection. However, if physical exercise is carried out with maximum intensity and is tiring, it is reported that it can cause impaired immunity resulting in decreased athletes' appearance (Ali, 2008; Arovah, 2010).

Submaximal physical exercise will increase oxygen uptake in active muscle cells, cause the formation of free radicals and the potential for oxidative stress (Senturk et al., 2005). Oxidative stress due to submaximal physical exercise is a physiological process that can cause a decrease in immune function (Mastorakos et al., 2005). So indirectly oxidative stress due to submaximal physical exercise results in an increase in a person's susceptibility to infection, which can reduce the degree of health (Glaser & Kiecolt-Glaser, 2005).

The body's main immune component in blood circulation is leukocytes. Leukocytes can be increased in an easy way, for example doing mild to moderate physical exercise such as aerobic exercise for 30 minutes five times a week, so as to be able to activate the work of leukocytes.

The study states that physical exercise with moderate intensity can increase the immune system, reducing susceptibility to disease that can be observed by increasing the number of leukocyte cells within normal limit (Irianti, 2008). The other study show that physical exercise with maximum intensity to fatigue, can actually cause impaired immunity with marked changes in the number of leukocytes (Harahap, 2008). Another study by Park and Lee (2011) states that training with a 60% load and 70% max VO₂ can increase the ability of apoptosis in lymphocyte cells.

The amount of vitamins in the body is very small and limited, but it is needed to especially in maintaining the immune system. Most vitamins cannot be synthesized by the body so it must be obtained from food, especially fruits and vegetables. To meet the needs of these vitamins and minerals, a balanced diet is needed. In certain conditions such as oxidative stress due to physical exercise, the body needs nutritional intake to meet the needs with the consumption of vitamin and mineral supplementation (Spears and Weiss, 2008). This study aims to determine the effect of antioxidants on maximum immunity after physical exercise.

2. Methods

Subject

The subjects of the study were 20 students of sports science, University of Medan State, male, non-athlete and no smoking.

Location and total time duration of research

This research was performed at the Physical Laboratory, Department of Sports Science, Faculty of Sport Sciences, Universitas Negeri Medan, and Medan Regional Health Laboratory, North Sumatra, Indonesia. Moreover, this research was completed starting from July to October 2019.

Design of Research

This type of research is a quasi-experimental with experimental design post test group design.

Data collection was conducted from July 2019 to October 2019. The study subjects were randomly divided into 2 groups, 10 people each. Group 1: sub-maximal physical exercise and placebo; Group 2: sub-maximal physical exercise and vitamin C. The dose vitamin C is 500 mg/ day, given for 14 days, before doing sub-maximal physical exercise. Before and after treatment on the research subjects,

the number of leukocytes and lymphocytes was examined. Data obtained were analyzed statistically with SPSS.

3. Result

The physical characteristics of the study subjects consisted of age (years), weight (kg) and height (cm) which have similar characteristics so that it can be said homogeneous, in table 1.

Table 1: Characteristics of Research Subjects

Variables	Mean	
	Group 1 (n=10)	Group 2 (n=10)
Age (year)	20	20
Body weight (kg)	61.6	61.8
Height (cm)	164,2	164.6

Keterangan: varians data homogen

Table 2: Effect of antioxidants on eosinophil after sub-maximal physical exercise

Variable		Group 1	Group 2
Eosinophi (%)	Pre test	2.7	2.9
	Post test	1.9	2.7
	%	42.1	7.4

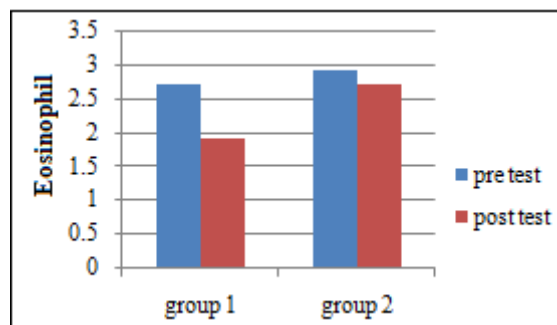


Figure 1: Effect of antioxidants on eosinophil after sub-maximal physical exercise

The results of this study indicate that there is a difference in the decrease in the average number of eosinophils, in both groups, listed in table 2. In group 1, namely the submaximal and placebo physical exercise groups, there was a greater decrease in the number of eosinophils compared to group 2 (42.10% vs 7.40%), as shown in Figure 1. This means that giving vitamin C after submaximal physical exercise can prevent a decrease in immunity.

4. Discussion

Eosinophils decrease due to submaximal physical exercise, this is due to stress due to activity resulting in an increase in hormone secretion from the adrenal cortex and one of the production produced by this hormone results in a decrease in the amount of eosinophils in the blood or eosinopenia, although this is still contradictory because there are other opinions which states the occurrence of eosinopenia is relatively related to the presence of marked lymphocytosis (Sodique, 2000).

The other of studies state that consumption of vitamin C 500-1000 mg / day can provide optimal antioxidant effects (Carol and Arah, 2001).

The number of eosinophils is approximately 2.5% of the number of leukocytes under normal circumstances. Eosinophils are distinguished from other cells because they have orange-red granules that contain basic proteins and destructive enzymes. Like neutrophils, eosinophils can also phagocytosis and kill microorganisms. If there is a suitable stimulus, eosinophils become active and degranulation occurs. As a result, various enzymes will be released to destroy mediators released by basophils and mastocytes (Kresno, 1996).

Antioxidants are not only important to prevent oxidative stress and tissue damage, but it is also important in preventing the increase in proinflammatory production of cytokines, which are the result of activating the body's defense responses that occur continuously.

Vitamin C is known as an antioxidant which helps neutralize free radicals. Vitamin C as an antioxidant because of its ability to reduce several chemical reactions, one of them is that it can reduce reactive oxygen species (SOR). Vitamin C also has a role as an electron donor. The ability of vitamin C as an electron donor makes vitamin C very effective as an antioxidant because vitamin C can quickly break the chain of reactions of SOR (Reactive Oxygen Species) and SNR (Reactive Nitrogen Species).

5. Conclusion

Submaximal physical exercise combined with taking vitamin C can prevent a decrease in immunity because vitamin C acts as an antioxidant that can neutralize free radicals produced during submaximal physical exercise

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