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Effect of One Session Strenuous Exercise on Some Factors of Immune System

[1]Parivash Piraki, [2]Zinat Ebrahimi and [1]Mohsen Piraki

[1]Department of Physical Education, Darehshahr Branch,
Islamic Azad University, Darehshahr, Iran
[2]Department of Physical Education,
Sanandaj Branch, Islamic Azad University, Sanandaj, Iran

Abstract: Type, intensity and duration of exercise, determine effect of exercise on the immune system and possibly susceptibility to upper respiratory tract infections in athletes. This study investigated changes in some immune parameters in male athletes after one session exhausting vigorous activity. The object of this research was investigated whether a strenuous exercise session can influenced on some factors of immune system in healthy athlete men. 20 healthy active male with average age 23.95± 3.5 were divided into tow groups: the experimental group and control group. Blood was collected at rest, immediately after exercise and 15min after exhaustive test to determine Leukocyte differential count. The training protocol consisted of: Bruce multistage protocol exhaustive. Data were analyzed by non-parametric Wilcoxon signed-rank test (α=0.05). Performed an exhausting exercise session, cause significant increase in leukocyte count athletes except in Eosinophils (p =.0.05). Eosinophils significant difference was not observed in values ??before and after exercise. The test group was Performed an exhausting exercise session that cause to increase in the number of white blood cells and its subordinates such as neutrophils, lymphocytes, basophils and monocytes, except eosinophils. This increase was maintained until 15 minutes after the activity. Percentage of neutrophils, lymphocytes, basophiles and monocytes and other blood lines on athletic subjects before, immediately after and 15 minutes after Bruce's test was significant The significant changes were observed in eosinophils. In summary, the results showed significant changes in the Bruce test blood neutrophils and lymphocytes compared with the study subjects before, immediately after and 15 min later were tested. Therefore, aerobic Progressive exercises until exhaustion cause to increase a stressor and Immunosuppressive effects on immune system.

Key words: Innate immune system · Exhaustive physical activity · White blood cell differential count · Professional athletes

INTRODUCTION

Studies have been conducted to determine the effect of exercise on the immune system, show Conflicting effects of exercise on the immune system. This means that moderate intensity exercise, because enhancing immune responses. While severe and exhausting exercise, the consequences are immune suppressors. Studies have been implemented about the possible relationship between exercise-induced muscle injuries, started the reaction cascade of inflammatory cytokines and suppressed immune systems. Studies have shown that heavy exercise, causing tissue damage, production of stress hormones and changes in usage and quality of immune cells. Changes in function and quality of immune cells influenced by neural factors - hormones such as catecholamine, growth hormone, cortisol and beta - endorphin and reproductive hormones [1].

The effect of heavy exercise, muscle tissue damaged and important nutrients, are taking. Result of These events are deterioration of immune function and decreased improve ability against infection. Both cases reduce the ability to exercise and competition. Also seen in professional athletes are more susceptible, for diseases

Corresponding Author: Zinat Ebrahimi, Department of Physical Education, Sanandaj branch, Islamic Azad University, Sanandaj, Iran, Tel: +9183336007.

such as upper respiratory illnesses, including colds and sinusitis especially in training and competition seasons [2].

Research-related infections in athletes and active people shows the upper respiratory tract infections are more susceptible in elite's competitive athletes and those who participate in extreme sports or too long, conversely, athletes who will compete less and those who do exercise with less intensity are not susceptible to infection. In fact, it is possible that regular moderate exercise cause enhance resistance to infection [1,3]. Since of existing reports There is a correlation between the intensity of activity and immune changes, The present study have been investigated the effects of one session of exhausting exercise on peripheral blood immune cells in athletes.

MATERIALS AND METHODS

20 healthy active men with the mean age 23.95± 3.5 years, height 177.32± 3.92, weight 69.60± 4.6kg, age, BMI 22.1±1.22 kg/m^2, Maximal aerobic capacity 51±1.3 ml/kg/min were divided into 2 groups: subjects equaled by height, weight, age, BMI, heart rate before starting Bruce moderate test. This interventional study was performed as pretest-posttest, after obtaining written informed consent. Maximal aerobic capacity (VO_{2max}) was measured by Bruce moderate test. No significant difference between bloods variables were observed in athletes before exercise. None of the participants in this study, do not have specific infection and disease during the 4 weeks before the study and also participated in this study did not receive antibiotics. During this study, none of the participants were not excluded. For control effect of exercise, participants were asked during the 48 hours before the test; refrain from doing any heavy exercise. In order to hold regular and normal test conditions, test athletes before, eat breakfast and during the experimental period, were allowed to consume water. Before starting the experiment, subjects were warming him by performed 10 min with gentle exercise and then the Bruce test performed. This study was approved by the faculty ethics committee. Personal information of participants in this study was kept confidential.

The Training Model: Subjects conducted on a treadmill machine a maximal exercise test (modified Bruce test) with a maximum VO2max. This test consists of 7 steps that change the velocity and pressure gradient in each phase of work.

Execution time was 3 minutes foe each steps. During the Bruce protocol, the Slope, the first step was zero in the second step of 5% and 10% in the third step appeared. Then during the fourth to seventh, a two percent slope with a constant ratio increased. Speed in the first three steps was fixed, then from third stage onwards, in every phase of increased. Experimental tests were performed to exhaustion.

The Experimental Protocol: Experiments, laboratory exercises, Shahid Beheshti University School of Physical Education at 23-20°C were performed. After the subjects were in place, they were asked to sit on a chair for 15 minutes. The systolic and diastolic blood pressure was measured and 2 ml of venous blood was taken from the subjects. Then each of the subjects warming for 5-10 min, then the modified Bruce protocol was performed. The second blood sampling was performed immediately after the test. After 15 minutes resting, third blood sampling was taken in prone situation. Blood samples obtained were transferred to the laboratory immediately. Using Cell Counter XL22 peripheral blood cells (leukocytes), i.e. monocytes, lymphocytes, neutrophils, basophils and eosinophils were counted.

Statistical Methods: Data analyzed by Wilcoxon Signed-rank test. Significance level was considered 0.05.

RESULTS

- Performed one session of exhausting, caused significantly increased in number of monocytes, lymphocytes, neutrophils, basophiles and whole of peripheral blood leukocytes in compared with the prior practice ($P > 0.05$). But this activity does not induce a significant difference in the number of subject's eosinophils in compared with before exercise.
- The number of peripheral blood leukocytes after exercise was still slightly above the basal level. The number of basophils was less than 14% of the baseline15 minutes after of activity. Meanwhile, the number of monocytes and eosinophils was reached to the lower limit 15 minutes after exercise.
- The total number of peripheral blood leukocytes reduced 15 minutes after exercise but this increase was not significant. The number of monocytes, neutrophils, eosinophils and peripheral blood lymphocytes also seemed to follow the above pattern.

Table 1: Comparing the number of white blood cells in subjects before and immediately after exercise

	Statistical indicators				
	Std deviation				
The variables	Before test	After test	df	t	p
Leucocytes	506±1369	8355±1820	19	-5.798	0.001
Notrophils	2845±1060	3565±1460	19	-4.013	0.001
Lymphocytes	2085±649	3820±1050	19	-6.344	0.00
Basophiles	45±60	105±39	19	-3.559	0.002
Eosinophils	150±76	160±82	19	-1.0	0.23
Monocytes	480±139	705±184	19	-4.149	0.001

CONCLUSION

In this study, immediately after exhausting aerobic exercise, total peripheral blood leukocytes and its subsets (monocytes, lymphocytes, neutrophils, eosinophils and basophilic) showed a significant increase in athletes. Increase in total peripheral blood leukocytes and its subsets (monocytes, lymphocytes, neutrophils, eosinophils and basophilic) after exercise has been confirmed in studies of other researchers [1,3-9]. But available reports did not mention basophiles and eosinophils changes after exercise. In this study, after heavy exercise, in addition to monocytes, lymphocytes, neutrophils, was observed a significant increase in the number of peripheral blood basophiles. While the Eosinophils, there was no significant increase. A significant increase in the number of peripheral blood basophiles circulation after heavy exercise can be needed Immune system to indicate the presence and activity of inflammatory cells to repair damage is caused by heavy exercise Such as increase in the number of another type of peripheral blood immune cells. On the other hand, no significant increase Eosinophils can be proved that these cells during inflammation and damage from heavy exercise don't have any role. And thus their number does not necessarily increase. On the other hand, it shows that the increased number of peripheral blood immune cells probably do not specifically done And the immune system avoid increasing the number of immune cells unnecessary. Studies have shown that the number of monocytes during and after intense exercise may have short and long term will increase to 100%.

Since monocytes are producing some of the regulators of the immune system (e.g. cytokines), so they enter the circulation during exercise may be increase the concentration of these factors. On the other hand, seems to call for rapid removal of monocytes during exercise and after exercise, is due to the need for implantation of these cells in the injured tissues [4, 6, 9].

Also the effects of strenuous exercise and exercise training on lymphocytes activated and increase their number in circulation. Correctly is not clear whether this phenomenon is due to activated selective recruitment of cells into the blood circulation or the activation of other immune cells during exercise. Number of lymphocytes with the increased load progressively rises and its rate depends on the type and intensity of exercise. Lymphocytosis of exercise may also be affected by the level of individual readiness, because cell counts after exercise compared with untrained individuals practicing entities have significantly increased [1,3,6,10]. Like this study, other studies also report that the number of neutrophils during exercise and then increased and their number in circulation, until hours after the end of exercise, still remains high. This increase reflects the significant recruitment of neutrophils and low activity immature cells into the circulation. It seems that activation of neutrophils during exercise occurs in response to mechanical load possibly structural damage. But not necessarily related to metabolic factors. The overall increase in neutrophil count during and after exercise depends on exercise type, intensity and duration [1,7,8,10-12]. Increase in the number of overall Leukocyte after heavy exercise was observed in this study is result of increase in the number of each leukocyte subtypes and it seems obvious. Available reports support these results [2,13-15]. But Wigeranaes study and colleagues in 2001 showed that after 15 minutes deactivate recovery, entire Leukocyte count is associated with a 43% reduction in total count and the number of neutrophils has decreased to 52% after 15 minutes inactive rest [12]. On the other hand, in this study the total number of peripheral blood leukocytes and peripheral blood of two important subgroups, i.e. neutrophils and lymphocytes decreased after 15 minutes of rest to the prone position compared with immediately after exercise. But this number was still higher (5% increase was observed compared to baseline) than baseline levels (number of cells exactly before exercise). While the study Wigeranaes and colleagues, the Leukocyte count in the blood sample after 15 minutes of passive rest was 19% lower than basal levels [12].

The contradictory results in above mentioned study can be related to the factors such as using different protocols with different training variables, athlete's physical condition, nutritional status and other variables such as genetic and racial differences and also subjects mental health condition. In order to study the biological nature of athletes, in the present study, volunteers were allowed to eat breakfast before exercise and consume water during exercise. All athletes consume of fruit juice immediately after exercise and before starting rest. While the study volunteers Wigeranaes fasting for 12 hours and were only allowed to consume water [2,16].

It seems that the athlete's blood sugar level in this study is very important parameters in establishing difference between the results of two studies. Because of hunger is associated with results such as lowering blood sugar and blood concentration of hormones such as cortisol and growth hormone.

Considering the above factors influence the number of peripheral blood leukocytes can be stated that Hunger before and during exercise can cause specific changes in blood leukocyte count that is not comparable with result of this study.

If it is assumed that the total number of athletes blood leukocytes after exercise, should be at least the minimum size the number of cells, to athlete after intensive activity don't Talented to respiratory diseases, including respiratory tract infections. It seems that the conditions for the athletes in this study was provided, don't have Negative effects on immune cells in peripheral blood of athletes because Leukocyte count after 15 minutes off the rest, was slightly greater than basal levels. In Wigeranaes study the number of leucocytes after inactive rest was 19% lower than basal levels that were possible this individual have risk of respiratory tract infections after exercise.

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