



Variation of Leukocyte Count in Athletes Before and After Exercise (Research Article)

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Abstract

Aim: To evaluate the difference in leucocyte count before and after exercise in athletes.

Methods & Materials: This study was conducted by selecting twenty healthy athletes within the age group of 18-24 years. They were exposed to regular running for atleast 3 years prior to this study. Procedure was explained to them. Before starting the procedure they were advised to take rest for 1 hour. As to start the procedure heart rate and blood pressure were checked and blood samples were taken to estimate the total leukocyte count and differential leukocyte count. After taking the sample the subjects were instructed to run for 20 minutes. After stopping the running again the blood samples were taken for same parameter. For estimation of total leukocyte count Turk's fluid was used and for differential leukocyte count the smear was stained with Leishman's stain.

Results: P value of <0.001 was considered as statistically significant.

Conclusion: Leukocyte counts will increase after exercise in athletes.

Key words: Turk's fluid, Leishman's stain, Cytokines, Interleukins

Introduction

In multicellular organisms each individual cell function for the well being of the entire organism of the whole body functions for the benefit of each individual cell which is known as homeostatis, a term coined by W.B. Cannon.^[1]

A stress such as the physical exercise produces destabilization of homeostatis. The compensatory mechanisms existing in the multicellular organisms like human body, battle with the stress induced effects and bring back the homeostatic state. In most instances, such compensatory

mechanisms operate in a feedback systems, which are endocrine in nature.

The stressful condition of the human body as in dynamic exercise increases the leukocytes, the motile unites of the body's defense system.

Exercise or adrenal injection mobilizes the margined granulocytes causing a temporary rise in WBC count.

Regular exercise increases resistance to infections such as the common cold. There is accumulating evidence that exercise is a life style that offers some protection against malignancy. It has become clear that moderate exercise stimulates the immune system and may be somewhat responsible for exercise related reduction in illness.

An effort has been made to evaluate the relationship between the different varieties of leukocytes and as such the immunological relationship between the pre exercise and post exercise levels in athletes. The total leukocyte count, neutrophil, lymphocyte, monocyte concentrations increase after exercise.

Materials & Methods

The study was conducted on male subjects, with age ranging from 18-24 years who are non smokers and non alcoholic not suffering with any ailment, disease or infection for the last one month till the completion of study. Twenty subjects are selected for procedure.

Each of the individual was medically examined and their past medical history has been carefully evaluated with an aim to exclude those individuals with cardiac or pulmonary disease or hypertension or diabetes mellitus. Thus unhealthy subjects were excluded and only the normal healthy male adults are accepted for this study. All the subjects were free from any infections and are not taking any drugs.

The criteria for selection of athletes is based on the fact that they have been trained or exposed to regular running for at least 3-4 years prior to the present study.

Prior to the study each subject was informed in details of its objectives and the aim of the research protocols and the methods to be used. Their consent was taken. They were well educated and motivated so at to extend the best cooperation in various exercise protocol.

Experimental protocol:

Twenty four hours before the experiment commenced subjects were refrained from taking any type of exercise and they are also abstained from caffeine containing beverages for 24 hours prior to and during the exercise. No attempt was made to limit the food or the other liquid intake. Before the actual procedure is begun the individual is subjected to a preceding period of rest ranging from half hour to one hour.

As a measure of dynamic exercise the subjects were asked to run for 20 minutes.

When he is ready to participate in the exercise protocol, the resting heart rate and the blood pressure are recorded. The heart rate is recorded by counting the pulse rate by palpating the radial pulse. Then the blood pressure both systolic and diastolic is recorded by using sphygmomanometer and the stethoscope. These recordings are made while the subject is made to lie flat on the table.

Blood samples are taken for the estimation of the total leukocyte counts and the differential counts of the leukocytes by giving a prick to the tip of the ring finger much a lancet under sterile conditions. The total leukocyte count was done by staining with Turks fluid and examining under a compound microscope with the help of Improved Neubauer's counting chamber. The differential leukocyte count was done after staining the smear with Leishman's stain and examining with the help of oil emersion lens.

After making the initial recording of the above parameters at rest the subject is instructed to run for 20 minutes. After stopping the exercise the blood samples are collected for the same parameters.

The data was analysed and the p value of <0.001 was considered as statistically significant.

Results

In athletes at rest the mean total leukocyte count is 6.64 ± 0.6745 , the mean neutrophil count is 54.56 ± 2.7092 , the mean lymphocyte count is 30.92 ± 1.8239 , the mean monocyte count is 6.04 ± 0.6110 .

After exercise, the mean leukocyte count is 9.452 ± 0.6564 , the mean neutrophil count is

58.28 ± 1.6713 , the mean lymphocyte count is 33.76 ± 1.7387 and the man monocyte count is 7.36 ± 0.7571 .

So when a comparison is made between pre and post exercise levels the total leukocyte count and as well as neutrophil count, lymphocyte count, monocyte count will show increased levels after exercise.

Tables

Comparison of total leukocyte counts in athletes at rest and after exercise

	Athletes at rest		Athletes after exercise		t	P	% ↓↑
	Mean	SD	Mean	SD			
Total Leukocyte counts	6.64	0.67	9.45	0.66	14.9373	<0.001	42% ↑

Comparison of Neutrophil counts, Lymphocyte counts and Monocyte counts in athletes at rest and after exercise

	Athletes at rest		Athletes after exercise		t	P	% ↓↑
	Mean	SD	Mean	SD			
Neutrophils	54.56	2.7092	58.28	1.6713	5.8424	<0.001	7 % ↑
Lymphocytes	30.92	1.8239	33.76	1.7388	5.6344	<0.001	9 % ↑
Monocytes	6.04	0.611	7.36	0.7572	6.7832	<0.001	22 % ↑

Discussion

In our study there is an increase in total leukocyte count and also an increase in the neutrophils, lymphocytes and monocytes after exercise compared with the pre exercise level.^[2,3,4]

Leukocytes play an important role in many clinical and physical stresses like surgery, trauma, sepsis and burns which induce as pattern of normal and immunological responses that have similarities to that of exercise. Exercise induces mobilization of most leukocytes causing leucocytosis.^[5]

Exercise stimulates cytokine release. The haemopoietic growth factors are called cytokines. Cytokine whose amino acid sequence is known is called as interleukin (L). The haemopoietic growth factors are the proteins that act as the intercellular mediators and control the growth differentiation and function of blood cells.^[6]

These growth factors originate from the macrophage endothelial cells, fibroblasts, and are present in tissue fluids and blood only in minute concentration.

Macrophages play a key role in controlling haemopoiesis through the secretion of cytokines ie I L-1 tumor necrosis factors etc.

The I L -1, I L -3, I L – 6 TNF thus act together in the protection of human body on exposure to stress such as physical exercise is brought about by the leukocytes through interleukins.

The increase in leukocyte number was due to increase in granulocytes especially neutrophils, as well as an increase in lymphocytes and monocytes.^[7] The increase of granulocytes after exercise is partly due to increased levels of cortisol.^[8]

So exercise and catecholamine infusion increase blood leukocyte counts. This leukocytosis is

caused by mobilization of the marginated pool of leukocytes and not bone marrow release of leukocytes.^[9] In addition to catecholamines, growth hormone and beta endorphins are increased during exercise causing leukocytosis.^[10]

Conclusion

Regular moderate exercise causes leukocytosis including increase in granulocytes, monocytes and lymphocytes. The cellular immune system is highly influenced by muscular exercise which will protect the individuals from infections.

During childhood and adolescence, bouts of exercise serve as powerful stimuli to the immune system. The inter action between exercise stress and immune system provide unique opportunity to link basic and clinical physiology and to evaluate the role of underlying stress and immunophysiological mechanisms.

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