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**Determine changes of plasma glucose of trained and untrained male rats after eight week endurance exercise**

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**ABSTRACT**

Skeletal muscle has the expression capacity of several cytokines, including Glucose are called Myokine. In 2008, Handschin and Spiegelman have recognised the Myokines as the cytokines produced by the muscle cells that show the relationship between sport and inflammation. Variables measured in the exercise and control groups were compared and then the descriptive and inferential statistics were used to analyse the hypothesis test. Natural distribution of data measured by the Kolmogorov-Simonov test, and the statistical analysis of the data performed using the software SPSS version 16 by the ANOVA test through repeated measurements based on the normal distribution. To compare variables between the two groups of the t test was used. The significant level for all calculations was considered as  $p < 0.05$ .  $t$  & meaningful level in dependent t-test cannot decline the hypothesis. So, 8-week endurance exercise is not a meaningful effect on plasma glucose level in male rats. There is not a meaningful effect on glucose in male rats in 8-week endurance exercise ( $p=0.473$ ) & the plasma glucose in trained rats is little more than un-trained rats & untrained male rats which it is not seem have significant difference in 8-week endurance exercise.

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**INTRODUCTION**

Skeletal muscle has the expression capacity of several cytokines, including Glucose are called Myokine. In 2008, Handschin and Spiegelman have recognised the Myokines as the cytokines produced by the muscle cells that show the relationship between sport and inflammation (20). Contractile activity is involved in the regulation of expression of high levels of cytokines in skeletal muscle. Myokines facilitate several cellular responses to exercise such as suppression of proteolysis, angiogenesis, and regulation of muscle glycogen. By the way, the IL-6 has attracted much attention, because it is related to insulin during the exercise, i.e. during the increase of performance (12). Refer to some studies, glucose injection during exercise reduces the increase of IL-6. Although carbohydrate supplementation during exercise inhibits the increase of serum IL-6 but has no effect on IL-6 increase in contracted

muscle (8,1,). IL-6 release from contracted muscle during exercise is a message for hepatic glucose production. It will enhance the substrate consumption of muscle and increase glycogen and fat oxidation. IL-6 may play a role in power supply on activate the lipolysis in adipose tissue during exercise. Short-term increases in IL-6 induced contraction can effect on metabolism while long-term increasing of serum IL-6 level can be associated with metabolic failure and cardiovascular disease (3,28). Beyond changes in weight, the mechanisms underlying which involved in regulation of energy balance and elegance. Cellular energy imbalance caused by this mechanism can be affected by many factors such as exercise (2). Physical activity with the metabolic changes induced by disruption of cellular energy charge increase fuel cell energy demand. Studies show that long-term exercise decreased glycogen and muscle ATP and liver. So physical activity increase energy balance and homeostasis within the muscle cell and muscle cell's demand (2).

The results help players and coaches to have players with the lowest cost of energy. And also know that in which situation they should exercise that density of this element be in their standard norms. And will be seen whether changes in these factors after 8 weeks or not. So according to previous research and the importance of the research project, first question is that whether the physiological state rats will change during exercise? And will this change effect on rats performance?

### Glucose

Atoms form basic building blocks of all matter and from their combination molecules will made. Most of results are composed of the same chemicals that only differ in terms of proportion and arrangement of the material. Carbon, hydrogen, oxygen and nitrogen are often the primary building blocks of the bioactive materials. and will made from carbon, oxygen, hydrogen, carbohydrate and fat(3). Carbohydrates are divided into three categories: 1. Monosaccharids sugar or menu 2. Two-sugar or oligosachharids 3. Several sugars and polysaccharides Mono saccharides are made of three or seven carbon polyether alcohols. Respectively, depending on the carbon number of building call them teryuz, tetruz, pentuz, hegzuz and heptuz, which pentuz and hegzuz in more important and glucose is the most important hegzuz. Glucose ( dextrose or grape sugar): six-carbon glucoses which observed in the fasting blood. In illness or we can't eat from mouth inject sterile glucoses through a vein. Glucose solution diverted the direction of polarized light to the cornea because of carbon which called dextrose and thereby distinguish it from fructose.

Glucose is a combination which is reducing and can reduce divalent copper salts. Nature food except grape contain amount of released glucose so starch consist of glucose molecules which are combined and glucose is available in structure of the sugar glucose and sucrose (2,16). Derivatives of sorbitol glucose (D- glucitole) is and alcohol which is obtained by the hydrogen of glucose. In this aldehyde (CHO) glucose will change to alcohol (CH<sub>2</sub>OH). Although sorbitol is found in the plants of berberis but is and industrial product and is used only in regime. Approximately 90% of sorbitol is absorbed and metabolized. Their absorption from intestines is gradual so has no effect on blood density (19).

When there is not enough carbohydrate in the food, gluconeogens provide glucose. The term of gluconeogens consist of all the mechanisms and pathways of noncarbohydrate converting to glucose and glycogen. If blood glucose density is lower than a critical level, we will have brain dysfunction which can lead to unconsciousness and death. Glucose is required in fat tissue as a source of glyceride and glycerol and may involved in maintaining the material level of citric acid cycle. Glucose is the only fuel that provides energy anaerobically in skeletal muscle. Blood glucose level primarily control by glycogen stored in the liver. When the blood glucose is low, liver glycogen change to glucose by glucogenolise and enters to bloodstream. Hence this glucose carried to skeletal muscle and other organs. The exact opposite occurs when blood glucose level is high. It means that glucose obtain by tissues and insulin hormone and change to glycogen by glycogenese level. If glycogens are full, glucose after changing to glycogen is use for metabolic purpose. Extra glucose may change to fat and store in fat cells. Muscle metabolism is used directly by the muscles and do not contribute directly to reserve blood glucose (17).

Estart Argey and coworkers (2011) examine effect of IL-6 on glucose transmission in skeletal muscle of rats. They examine legs muscle of rats with density of combination of IL-6 and IL-6SR. the amount of active and phosphorylation AMP proteins (AMPK) and Kinaz protein B was measured and result show that physiology and super physiology IL-6 has no effect on glucose transmission. IL-6 and IL-6SR increase 1.4 ( $p < 0.5$ ) glucose transmission with no changes in phosphorylation AMPK. IL-6 and IL-6SR increase 2 ( $p < 0.5$ ) glucose transmission with increase in phosphorylation AMPK. Anna Gari Holmz and coworkers (2006) examine effect of adrenaline

hormone on IL-6 and its release to if IL-6 plays a individual role in metabolism control or not. By lack of adrenaline on IL-6, research on metabolic process during rest and exercise. The observe increase in turning proteins of IL-6.

Annaji Holmz and coworkers (2008) study on increase of IL-6 on rats by external injection. They suppose that continuous increase in IL-6 can prevent insulin sensitivity. Wistar male rats was treating 14 times by human IL-6 (2.4 mg per day) or salt solution with low osmotic properties (continuous IL-6). IL-6 increase free fat acids but did not increase triglyceride accumulation in skeletal muscle or liver but increase PPR  $\alpha$  and VCP2 in skeletal muscle .

## MATERIALS AND METHODS

As long as the subjects of the different groups of this research were rats, which were in a controlled environment and at a pre and post plan neatest, under the effects of independent variable (8-week exercise program), so there search method is experimental. In the present research, after the initial agreement, fourteen 3-month-old male Westar rats were obtained from the Pasteur Institute Centre of Amol.

After completion of training and 48 hours after cessation of exercise, and after 4 hours of fasting from food, the rats were anesthetized by intra peritoneal injection of a mixture of examine and analyzing. The liver tissue was cut off immediate Ely and placed in liquid nitrogen and then the tissue were homogenized with 17 mm phosphate offer and with a speed of 8000 rpm.

### Rats weight measurement:

They measure rats weight every three days by a digital balance, 0.01 sensitivity, (made of Sartarias company of Germany).

**Glucose measurement:** To measure the glucose Iran Test Pars Kit and enzyme colourology method was used.

The blood samples centrifuged immediately for 10 min at 1500 rpm. The plasma transferred in special micro tubes (3 samples of each) and became frozen in liquid nitrogen, and was maintained for subsequent measurement in the freezing of the temperature of  $-80^{\circ}\text{C}$ . to avoid the evening effects, sampling began from 8 am and was completed 11:30 am. Variables measured in the exercise and control groups were compared and then the descriptive and inferential statistics were used to analyse the hypothesis test. Natural distribution of data measured by the Kolmogorov Simonov test, and the statistical analysis of the data performed using the software SPSS version 16 by the ANOVA test through repeated measurements based on the normal distribution. To compare variables between the two groups of the t test was used. The significant level for all calculations was considered as  $p < 0.05$ .

## RESULTS

There is significant difference between plasma glucose concentration in trained & untrained male rats.

Zero hypotheses ( $H_0$ ): there is no significant difference between plasma glucose concentration in trained & untrained male rats.

Table (1): dependent t-test for comparison plasma glucose in trained & untrained rats

Variable group	Mean	Standard deviation	t	Freedom rats	Meaningful level	Result
Controlling group	127.57	17.86	-0.723	12	0.473	Declined the zero hypothesis
Exercising group	135.43	22.53				

Based on table (1) & "t" & meaningful level in dependent t-test cannot declined the hypnosis. So, 8-week endurance exercise is not meaningful effect on plasma glucose level in male rats.

Based on diagram (1), the plasma glucose in trained rats are little more than untrained rats, while, there is not remarkable different among these 2 groups.



Diagram (1): comparison among plasma glucose (mg in Dc) in trained & untrained rats

### CONCLUSION

There is not meaningful effects on glucose male rats in 8-week endurance exercise ( $p=0.473$ ) & the plasma glucose in trained rats is little more than un-trained rats & untrained male rats which it is not seem have significant different in 8-week endurance exercise.

Argeri (2009) studied on effects of interleukin-6 & its receiver on glucose transfer in rats' skeletal muscles & the results showed that the interleukin-6 & upper physiological didn't have effects on glucose transport. SIL-6R caused to increasing 1.4 times ( $P \leq 0.50$ ) in glucose main transportation without AMPK phosphorylation in physiological level

These findings were not meaningful changes because of subjects' meal & kinds of their activities affected on it, also Holmes (2006) surveying on effects of adrenaline hormones on interleukin-6 & noticed to the realizing whether the creating interleukin in fat metabolism regulation or not. The obtained results in this kind of rats with interleukin-6, general androgen weak the interleukin-6 & glucose tolerance, against in a rat model improved both of treatment & critical interleukin-6 by adrenaline hormones injection with different doses Holmes et al (2008) studied on releasing interleukin-6 in human muscles by doing exercising & uptake glucose in human muscles & showed that there is positive relationship between interleukin-6 & glucose uptake & said that there is relationship interleukin-6 & glucose homeostasis during exercising & can be acted as carbohydrate sensors. When doing more exercising caused to more needs to carbohydrates & based on its abilities to simulating liver glucose along with releasing interleukin-6 from skeletal muscles contraction caused to increasing the glucose delivery so have role in keeping the glucose homeostasis.

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