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## Genetic markers as indicators of training guidance and its effect in a Muscular strength endurance and lactic acid level for weightlifting beginners

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### Abstract

The research aimed to classify young weightlifters according to the genetic markers of carboxylate transporters. (MCT4), preparing exercises that suit the characteristics of junior weightlifters, who carry a type of carboxyl transporter (MCT4), and identifying the effect of the exercises b Genetic markers in \_ The endurance of muscle strength and the level of lactic acid for them, and the experimental method of the two experimental groups was adopted on a sample of young weightlifters of the Iraqi national team for the sports label (2021) Of them (11) young, they were all selected by a comprehensive inventory method by (100%) from their community, and then they were divided deliberately after the procedures of analyzing the genetic markers for carboxyl transporters (MCT4) into two experimental groups, and specialized trainings were applied in each of the two experimental groups in an iterative manner for a period of time. (10) consecutive weeks with the total loads placed on them (30) training units, and the difference between the two groups was for juniors with type (AT) in the first experimental group, and type (AA) in the second experimental group, and after the end of the experiment and the results were processed using (SPSS) system The conclusions and applications were that the difference in genetics among weightlifters had a role in the difference in their receiving weight training and its positive effects on them in both increasing the development of muscular strength endurance and decreasing the concentration of lactic acid, and that weightlifting beginners with the genotype (AA) Carboxyl carriers of the gene (MCT4) were better than those of the (AT) genotype. In increasing the development of endurance of muscular strength and the lack of concentration of lactic acid, it is necessary for the national teams to rely on the principle of individual sports training, and to take into account the privacy of each weightlifter by accrediting studies of molecular medicine, and to increase the knowledge of trainers to support their planning of appropriate exercises for lifters, especially the young ones.

**Keywords:** Genetic markers for weightlifting juveniles, endurance of muscular strength, lactic acid

### Introduction

Molecular medicine and genetics entered the field of sports since genes were the factories of muscle protein, and because the movements of achievement in various activities depend on muscle strength, it enters into our understanding of many factors that contributed to the development of our limited understanding of achievement, and that the contributions of specialists and countless scientists included constant progress, On the other hand, there are leaps forward due to new and wonderful ideas or the introduction of new technology that produce new information, and there is often a slower and more steady accumulation of new information, that is, a wide variety of biochemical methods are now available in the world of sports, The application of techniques developed with use in the laboratory of biochemistry and in molecular medicine ensures that the science of sports can continue to advance in the state of health, A gene is defined as a hereditary element that is transmitted from parents to children “ responsible for one or more genetic traits. Chemically it is defined as a sequence of nucleotides along a molecule (DNA), and the organism within a population is not all copies of the gene are the same in Nucleotide sequences and alternate forms. The gene is called alleles (alleles) gene, and different alleles can encode for the same gene. ” (Robert, 2005) <sup>[17]</sup> Genes are also defined, according to molecular biology, as "the units of genetic factors that are located in special locations on chromosomes and are responsible for determining the phenotypic characteristics of living organisms, and a gene is also defined as a specific piece of the DNA molecule that

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determines the arrangement of acids. The amino acid component of a protein, and the number of genes ranges between (50-100) thousand in each cell, and the gene consists of thousands of pairs of bases ranging from (10000) thousand to (30,000) thousand pairs of bases, and it controls human traits about more than (50,000) more than fifty thousand genes. (Ahmed, 2019) <sup>[1]</sup> As for the chromosomal body is the set of distinct chromosomes in humans consists of (23) pairs of large linear chromosomes of different sizes, and there are (46) chromosomes in each diploid cell. Human chromosomes are usually divided into seven groups starting from (A) up to (G)) Plus a pair of sex chromosomes (x.) and (y). (Schaffer & Tommerup, 2005) And in light of that the genetic language is made up of four chemical letters, usually symbolized by the symbol (C, G, T, A), the genetic rhus, which are the first letters of the nitrogenous rules. The language of the universe is only four letters. (Baha, 2010) <sup>[3]</sup> Also, "in order for the cell to maintain its metabolic biochemical balance, it depends on cellular regulators including glucose transporters such as GLUT1). (GLUT4 & and monocarboxylate transporters as well, of which MCT4). " (Juel, 2006) <sup>[12]</sup> The clarification of that mechanism is "that the site of Jin (MCT4) in mitochondria (energy houses) and in the membranes of fibrils enables it to perform its tasks by transporting lactic acid produced by the metabolism process across the cell membrane as well as regulating the pH of the cell. (Rasmussen & Lundby, 2011) <sup>[15]</sup> Perhaps entering into these genetic details of the functional structure of carboxyl transporters gives indications that weightlifters differ among themselves in terms of diversity in which individual differences in endurance are shown in continuous muscle strength training in different training periods, and thus each weightlifter can differ from his peers. In the responses of biochemical processes to the calorie-supplied metabolism to meet the requirements of muscle strength training effort and in the appearance of signs of fatigue, the physiological reactions of the body when facing external loads also differ from one originating in lifting weights to another, as "the issue of vital energy is one of the important and necessary topics that should be The coach has to take it into account well, and the size of the basic energy of the player depends on many factors, the most important of which are the player's weight, height, chronological age, training age, state of the neuromuscular system, compatibility with the hormonal system and the amount of effort expended." (Emad, 2007) <sup>[7]</sup> Also, "in glucose metabolism, pyruvic acid turns into lactic acid, which then diffuses out of the muscle cells into the meniscal fluid and the blood. Therefore, a lot of muscle glycogen practically becomes lactic acid, but in this process large amounts of (ATP) are formed." Without consuming (O<sub>2</sub>), it can be used as a quick source of energy when it is required to obtain a short to medium-term muscle contraction, but it is less rapid than the phosphagenic system and is equivalent to almost half its speed, and in ideal conditions the lactic acid system can provide great muscle efficiency For (1.3-1.6) minutes in addition to (8-10) seconds in the phosphagenic system, studies indicate that all cells of the body are able to store at least some glycogen, but there are cells that store large amounts of it, especially liver cells that can store approximately (5) -8%) of its weight is glycogen, and muscle cells can store up to (1-3%) of its weight as glycogen. (Chad, 2005) <sup>[4]</sup> Lactic acid is defined as the final product of the second anaerobic energy system, which quickly dissociates to release hydrogen ion (H<sup>+</sup>) and the remaining substance combines with sodium or potassium salts to form a

salt called lactate. (Raysan and Abul-Ela, 2016) <sup>[16]</sup>, "This result is determined in most exercises in the world of sports and is one of the most important biochemical indicators of its efficiency in muscle cells and the efficiency of even the weightlifter himself, and its quantity increases in natural conditions in adolescents and women due to the difference (Vo<sub>2</sub>Max) between them." (Ham, 2009) <sup>[9]</sup> Thus, there are no experimental interactions in dealing with the topics of genetics, chemistry and training, given that "Developing the level of muscle strength is one of the important things that every coach seeks to achieve and every player tries to reach, and this development must be logical and without exaggeration, as the appearance of fatigue is a physiological problem that negatively affects physical and skill performance." (Jack, 2008) <sup>[11]</sup> Also, "we cannot challenge the natural predisposition of the inherited gene, but we can divide the athletes into categories according to the characteristics that this gene carries that give it diversity in its expressions. In addition, specialized training can help in some transformations in its functionality, but this matter it seems a bit complicated because it takes a relatively long time to match the competition duration of the event or the specialized game for this athlete." (David B & Chuck, 2005) <sup>[5]</sup> to add to this the need to classify weightlifting juniors according to the connotations of their genetics in support of confirming the principle of individuality in modern sports training in legalizing training loads in line with inherited characteristics in order to develop them to suit the requirements of achievement or break the numbers achieved for these The category of lifters, and through the work of the academic researcher in the physiology of sports training and a trainer for the junior category of weightlifting, he noticed the lack of interest in this classification of the budding lifters according to the connotations of their gene despite its great importance in the world of games today and modern trends to achieve raising the training status of juniors without exaggerations that may lead to The risks arising from indifference to the precautions of overloading muscular strength training for this category, with the aim of this research to: Classify weightlifters according to the genetic markers of carboxylate transporters (MCT4), and prepare exercises that suit the characteristics of weightlifters who carry a type of carboxylate transporter (MCT4).), and learn about the effect of the exercises b Genetic markers in \_ The endurance of muscle strength and the level of lactic acid they have, which the researcher assumed: There are statistically significant differences between the results of the muscular strength endurance tests and the level of pre and post lactic acid for the two experimental research groups, and there are statistically significant differences between the post results of the two experimental research groups for the muscular strength endurance tests And the level of lactic acid.

## Methodology

**Research Methodology:** To be appropriate to reach solutions to the problem presented in this research, the researcher adopted the experimental method by designing the two experimental groups with tight control in the pre and post tests. Proving hypotheses." (Mohamed, 2011) <sup>[15]</sup>.

Research community and sample: The limits of the research community are represented by the junior weightlifters affiliated with the Iraqi national team participating in the sports competitions (2021). Of them (11) juveniles, they were all selected by a comprehensive inventory method of (100%) from their community, and then they were divided

intentionally after the procedures of analyzing the genetic markers for carboxyl transporters (MCT4) into two experimental groups.

**Measurements and Procedures:** Based on the requirements at the beginning of the procedures, the researcher classified the total sample according to the laboratory method using the analytical tests of molecular medicine when extracting (DNA) of the blood sample of each emerging from the total sample by means of a laboratory centrifuge (Centrifuge) and a freezing device laboratory deep (Deep Freezer), laboratory electrophoresis (vortex), laboratory thermopolymer (PCR), laboratory shaker, laboratory Microwave for heating agarose solution, and laboratory gel electrophoresis, to result in The analysis categorized the youngsters who carry the type (AT) with a number of (5), and those with the genotype (AA) With a number (6), after that, the dependent variables were measured in the tribal tests for each of those who withstand the force in the test (Al-Hazaa, 2009) [2] with a unit of measurement of the number of times in the lab below the bar, giving the start signal, the lab starts pulling with the arms to raise his body until He reaches his chin above the crossbar, then lowers his body until the arms are fully extended as he was in the starting position and repeats the previous performance as many times as possible without stopping, and

measure the lactic acid from the nipple by means of a portable device (Lactic pro) type (COSMED) after the effort on A stationary bicycle for a period of (90) seconds with a duration of (5) minutes with a unit of measurement for this chemical compound mmol, and specialized exercises were applied in each of the two experimental groups in a repetitive manner for a period of (10) consecutive weeks at a rate of (3) training units between one day and another to be in each unit of them (4) exercises with intensity ranging between (90-100%) of the difficulty of the exercises and with a rest period between exercises (2-5) minutes, so that the total loads placed on them constitute (30) training units, and these exercises are the most common in training juniors with weights and are approved In most of the sources and literature followed for the advanced level of The difference between the two groups was for young people with type (AT) in the first experimental group, and type (AA) in the second experimental group, and after the completion of experimentation, post tests were conducted for each of the dependent variables, then the results of the tribal and remote tests were tabulated to be treated with a system (SPSS) to extract the values of each of the percentage, mean, standard deviation, t-test for uncorrelated samples, and t-test for correlated samples.

**The Results and their Discussion**

**Table 1:** shows the results of the tribal tests between the two groups the two trials in the dependent variables

Test and group		The number	Arithmetic mean	Standard deviation	Levine Contrast Smoothing	(Sig)	(T)	(Sig)	The meaning of the difference
Endurance muscular strength	Experimental (1) (AT)	5	6.8	1.924	0.258	0.623	0.62	0.551	not significant
	Experimental (2) (AA)	6	6.17	1.472					
Lactic acid concentration	Experimental (1) (AT)	5	5.18	0.311	0.434	0.758	0.829	0.429	not significant
	Experimental (2) (AA)	6	4.68	1.298					

The degree of freedom n- 2 = (9), not significant if (Sig) < (0.05) at the level of significance (0.05)

**Table 2:** It shows the results of the pre and post tests for the two experimental groups in the dependent variables

The test	The group	Comparison	Arithmetic Mean	Standard Deviation	Average Differences				The meaning of the difference
Endurance muscular strength	Skew difference Experimental (1) (AT)	(v) calculated	Degree (Sig)		3.6	2.408	3.343	0.029	D
		Tribal	6.8	1.924					
	Experimental (2) (AA)	After me	10.4	1.14	8.5	1.761	11.825	0.000	D
		Tribal	6.17	1.472					
Lactic acid concentration	Experimental (1) (AT)	After me	14.67	0.516	1.44	0.23	13.987	0.000	D
		Tribal	5.18	0.311					
		After me	3.74	0.372					D
		After me	2,683	0.1169					

Significance of difference (Sig) ≥ (0.05), degree of freedom (n) - (1) for each group, level of significance (0.05).

**Table 3:** Shows the results of the post-tests between the two groups in dependent variables

Test and group		The Number	Arithmetic Mean	Standard Deviation	(T)	(Sig)	The meaning of the difference
Endurance muscular strength	Experimental (1) (AT)	5	10.4	1.14	8.27	0.000	D
	Experimental (2) (AA)	6	14.67	0.516			
Lactic acid concentration	Experimental (1) (AT)	5	3.74	0.372	6.647	0.000	D
	Experimental (2) (AA)	6	2,683	0.117			

The degree of freedom n- 2 = (9), not significant if (Sig) < (0.05) at the level of significance (0.05)

It can be seen from the results of Table (2). private b The pre and post tests of the two experimental groups that the juniors in each of them had developed their endurance of muscular strength and an improvement in the decrease in the level of lactic acid after (5) minutes of effort, and the results of the post-comparison between the two research groups mentioned in Table (3) showed the superiority of the juniors of the experimental group The second genotype (AA) On the juniors

of the first experimental group with the genotype (AT), the researcher attributes the results of this development and improvement to more appropriate training for the juniors of the second experimental group with the genotype. (AA), and that their peers in the other group need to take into account the specifics in preparing exercises for them that suit their genetic expression, that the carboxylate transporters were less efficient for them in excreting lactic acid, which harms the

muscular strength endurance exercises they received in the same exercises, in this development helped to The biochemical regulation of the accumulation of lactic acid in the blood, as well as the appropriateness of repetitions and duration of exercise to tolerate this acid, which improved the anaerobic lactic energy production system of muscle cells in the runners of the two groups. Recycling operations or a good investment of re-utilizing this acid in building energy compounds after converting it to biovic faster and that the mutations were helping factors to prepare them for this advanced level in the disposal of lactic acid and the organization of cellular chemical processes to benefit from it in liberating energy after passing through chains The various transfers, and in this way, the exercises must be appropriate to the specifics of each player with its molecular properties, and there should be no reliance on tests Achievement When rationing his exercises, "there must be rationing in the components of the loads of intensity, size and comfort so as not to cause any health, physical or technical harm to the athlete." (Hussein and Amer, 2006) <sup>[10]</sup>, and "the glycogen stored in the muscles can be split into glucose, which is used to obtain energy, and the first stage of this process is called glycolysis, and it occurs without the use of (O<sub>2</sub>). Therefore, it is said For this process, by the anaerobic system (Anaerobic Metabolism), each molecule of glucose is split in the process of glycolysis into two molecules of pyruvic acid, and energy is released to form several molecules of (ATP), and then pyruvic acid usually enters the mitochondria in muscle cells and reacts with (O<sub>2</sub>) to form more (ATP) molecules, but when there is no (O<sub>2</sub>) available Sufficient for this oxidation stage of glucose metabolism, the pyruvic acid turns into lactic acid, which then diffuses out of the muscle cells into the meniscal fluid and the blood. ATP) without consuming (O<sub>2</sub>), it can be used as a quick source of energy when it is required to obtain a short to medium-term muscle contraction, but it is less fast than the phosphagenic system and is approximately half its speed, and in ideal conditions the lactic acid system can provide effective Great muscle for a period of (1.3-1.6) minutes in addition to (8-10) seconds by the phosphagenic system. Domenech & Other, 2005) <sup>[6]</sup> Our genetic material, which consists of deoxyribonucleic acid (DNA), dictates the formation of protein, and these two (DNA) and protein formation, respectively, control the formation of proteins. Metabolism of all other chemical elements and compounds from which our cells and tissues are made, just as the human body consists of a large group of (biochemical elements) that interact with each other to provide us with both structure and function. And all our other natural properties, as for the function, its importance is manifested to a greater degree because it determines strength, speed, energy and skill, but all these phenomena must have a biochemical basis as well; Physiology and medicine provide no more than natural explanations for underlying biochemistry, and the base of heredity and athletic talent, which is a rare gift, was inherited by the athlete in particular from his parents or a relative influential in genetics." (Firas and Ayed, 2020) <sup>[8]</sup> as " Monocarboxylic compounds play key roles in controlling lactate and the metabolism of carbohydrates, lipids and amino acids, as these cells transport them across the plasma membrane. cellular to benefit from it for bio-energy. " Domenech & Others, 2005) <sup>[6]</sup>, as "a decrease in the concentration of lactic acid in the blood indicates an improvement in the physiological state of the runner, and his ability to continue the physical effort." (Sawka & Miles, 2004) <sup>[18]</sup> As " sports training leads to the occurrence of

various physiological changes that include all vital body systems and these changes occur at the level of cells and tissues as well, and include anaerobic and aerobic changes to produce the energy needed for athletic performance, and given the breadth and depth of dealing with sports physiology during recent years, researchers were able to obtain Important physiological information and facts that contributed to the development of sports training, (Omar, 2018) <sup>[14]</sup>.

### Applications

1. The difference in genetic markers among junior weightlifters has a role in the difference in their receiving of weight training and its positive effects on them in both increasing the development of endurance of muscular strength and decreasing the concentration of lactic acid.
2. Junior weightlifters with the AA genotype Carboxyl carriers of the gene (MCT4) were better than those of the (AT) genotype. In increased development of muscular strength tolerance and decreased concentration of lactic acid.
3. It is necessary for the national teams to rely on the principle of individual sports training, and to take into account the specificity of each weightlifter by accrediting studies of molecular medicine, and to increase the knowledge of coaches to support their planning of appropriate exercises for lifters, especially the young ones.

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