Al-Rafidain Journal for Sports Sciences
https://rsprs.uomosul.edu.iq

The response of some antioxidants to 50m and 400m freestyle swimming

Amjad Hatem Ahmad
amjad.hatem89@mosul.edu.iq
University of Mosul/ College of Physical Education and Sport Science

Article information

Article history:
Received:18/11/2024
Accepted:16/01/2025
Published online:15/04/2025

Keywords: Freestyle Swimming, Antioxidants

Correspondence:
Amjad Hatem Ahmad
amjad.hatem89@mosul.edu.iq

Abstract

The primary function of antioxidants is to prevent cellular oxidation, which leads to the production of free radicals. Free radicals are atoms that have lost an electron, making them chemically unbalanced or extremely unstable. In their quest to regain balance, they react with other compounds, breaking their structure—these compounds include cell components, leading to damage, destruction, and deterioration. However, by divine design, antioxidants provide the free electrons that these dangerous free radicals seek, neutralizing them. Antioxidants are found in plants, vegetables, and other natural sources. (Kostaropoulos et al., 2006, 611-616)

Scientific studies on the effects of high, moderate, and low-intensity swimming exercises on blood antioxidants remain limited and relatively recent. Studies have shown that such exercises lead to the formation of free radicals due to oxygen consumption (O_2). Simultaneously, the body produces the necessary antioxidants to counteract these radicals.

One study by **Kostaropoulos et al. (2006)** aimed to compare adaptive responses in antioxidant mechanisms and oxidative stress in the blood of long-distance and short-distance runners. (Kostaropoulos et al., 2006, 611-616) Another study by **Pu-his et al. (2004)** titled *"Changes in Blood Lipid Peroxidation After a Single Session of Intense Exercise"* aimed to examine the changes in lipid peroxidation and blood antioxidants after different exercise intensities.

Based on previous research, the current study examines the impact of swimming at two different intensities on certain antioxidants as they reflect free radical activity, which negatively affects individual health. Free radicals pose an imperceptible challenge to athletes worldwide, whether in endurance-based activities (aerobic effort) or short-duration, high-intensity activities (anaerobic effort).

A review of existing studies show that most studies have focused on oxidative and antioxidant responses to continuous aerobic exertion in various sports. However, studies on antioxidant responses to both aerobic and anaerobic effort in a water-based environment are scarce. This gap led to the current study, which investigates the response of certain antioxidants to two different intensities (aerobic and anaerobic) in swimming.

Study Objectives and Findings

The study aimed to identify the differences in specific antioxidants following **50-meter** and **400-meter freestyle swimming.** The researcher hypothesized that there would be significant differences in antioxidant levels after these swimming efforts.

The study employed statistical tools such as mean, standard deviation, paired t-test, and **SPSS v11** for data analysis.

The results indicated:

- A higher increase in **malondialdehyde (MDA)** levels after the **50-meter freestyle** compared to the **400-meter freestyle.**
- A greater **decrease in superoxide dismutase (SOD)** levels after the **50-meter freestyle** compared to the **400-meter freestyle.**
- An increase in **catalase levels** after the **50-meter freestyle** but a decrease following the **400-meter freestyle.**

Recommendations

The researcher recommended consuming certain supplements during athletic training to reduce the harmful effects of free radical accumulation. These include **fenugreek, ginger, red pepper, pomegranate juice, and grapes,** among others.

Additionally, further studies should explore:

1. The recovery of enzymatic antioxidants after exertion.
2. The effects of aerobic and anaerobic effort on athletes after administering specific antioxidants (e.g., vitamins) to assess their impact on **lipid peroxidation** and other antioxidants

DOI: (10.33899/rjss.2025.187261),

استجابة بعض مضادات الاكسدة لسباحة ٥٠ و ٤٠٠ متر حرة

امجد حاتم احمد كلية التربية البدنية وعلوم الرياضة / جامعة الموصل
Amjad.hatem89@uomosul.edu.iq

تاريخ تسليم البحث (٢٠٢٤/١١/١٨) تاريخ قبول النشر (٢٠٢٥/١/١٦) تاريخ النشر (٢٠٢٥/٤/١٥)
DOI: (10.33899/rjss.2025.187261)

الملخص

تقوم الوظيفة الأساسية لمضادات الأكسدة «Antioxidant» على منع عملية التأكسد الخلوي الذي ينتج عنه الشوارد الحرة (الجزيئات الحرة) (Free radicals) وهي كل ذرة فقدت الكترونا لتصبح غير متعادلة كيميائياً أو غير مستقرة لدرجة هائلة وتبحث عن الكترون لتحقق به تعادلها واستقرارها فتتحد مع مركبات أخرى وتمزق تكوينها وهي مكونات الخلية فهي تتلفها وتحطمها وتدمرها لكن الله سبحانه وتعالى وفر الالكترون الذي تبحث عنه هذه الشوارد الحرة «الجزيئات الحرة» الخطيرة في مضادات الأكسدة وهي موجودة في نباتات وخضراوات ومما تخرج الأرض-Kostaropoulos et al., 2006, 611) . 616)

ولا تزال الدراسات العلمية قليلة وحديثة حول تأثير تمارين السباحة ذات الشدة العالية والمتوسطة والمنخفضة على مضادات الأكسدة في الدم إذ وجدوا أن هذه التمارين تؤدي إلى تكوين الجذور الحرة وذلك من خلال استهلاك O2 وفي الوقت نفسه ينتج الجسم ايضا مضادات الأكسدة اللازمة لذلك التكون

، ومن هذه الدراسات دراسة (Kostaropoulos et al., 2006) هدفت الدراسة الى مقارنة الاستجابات التكيفية لآليات مضادات الأكسده والجهد التأكسدي في الدم بين عدائي المسافات الطويلة والقصيرة (Kostaropoulos, et al., 2006, 611-616)

ودراسة (Pu-his, et al., 2004) "التغيرات في بيروكسيدة الدهن الدم بعد جلسة واحدة من التمرين المجهد" التي هدفت هذه الدراسة إلى معرفة تغيرات بيروكسيدة الدهن ومضادات الأكسدة في الدم بعد شدد مختلفة من الجهد ومن خلال ما تقدم ذكره فان دراستنا الحالية تناولت موضوع السباحة في جهدين مختلفين وتأثيرها في عدد من مضادات الاكسدة كونها تمثل منعكسات لنشاط الجذور الحرة ذات التأثير السلبي على صحة الفرد وكونها مشكلة غير محسوسة تواجه الرياضيين في جميع انحاء العالم سواء في الفعاليات التي تتطلب فترة زمنية طويلة نسبياً (الجهد الهوائي) أو الفعاليات التي تتطلب فترة زمنية قصيرة نسبياً (الجهد اللاهوائي) من خلال الاطلاع على البحوث والدراسات وجدنا أن معظمها تركز على استجابات دلالات الأكسدة ومضادات الأكسدة للجهد الهوائي المستمر وفي فعاليات رياضية مختلفة ، في حين لوحظ أن هناك ندرة في البحوث والدراسات التي تناولت استجابات دلالات الأكسدة ومضاداتها للجهدين اللاهوائي والهوائي في محيط مائي ، وهذا ما حفنا لدراسة استجابة بعض مضادات الاكسدة لجهدين (هوائي ولاهوائي) في محيط مائي وهدف البحث إلى التعرف على الفروق بين بعض مضادات الاكسدة بعد سباحة ٥٠ متر و٤٠٠ متر سباحة حرة وافترض الباحث وجود فروق ذات دلالة معنوية بين بعض مضادات الاكسدة بعد سباحة ٥٠ واستخدم الباحث الوسط الحسابي والانحراف المعياري واختبار t للعينات المرتبطة والحقيبة الاحسائية spss الاصدار ١١ لمعالجة البيانات واستنتج الباحث ارتفاع مستوى المالونداياالدهايد بعد سباحة ٥٠ متر حرة اكبر من ٤٠٠ متر حرة وانخفاض مستوى السوبراوكساید ديسيموتيزو بعد سباحة ٥٠ متر حرة اكبر من ٤٠٠ متر حرة وارتفاع مستوى الكاتاليز بعد سباحة ٥٠ متر حرة وانخفاضه بعد ٤٠٠ متر حرة ووصى الباحث بتناول بعض المكملات عند التدريب الرياضي لتقليل أضرار تراكم الجذور الحرة ومن هذه النباتات الحلبة ،الزنجبيل ،الفلفل الأحمر، وعصير الرمان ،والعنب وغيرها وإجراء دراسة حول استشفاء بعض مضادات الأكسدة الانزيمية بعد الجهد وإجراء دراسات أخرى حول تأثير الجهدين الهوائي واللاهوائي على ممارسي النشاط الرياضي بعد اعطائهم بعض أنواع مضادات الأكسدة مثل بعض الفيتامينات وقياس مدى تأثيرها على بيروكسيدة الدهن ومضادات الأكسدة الأخرى

الكلمات الافتتاحية : السباحة الحرة مضادات الاكسدة

1- Introduction to research

1-1 Introduction and the importance of research

The study of free radicals resulting from physical effort is one of the factors that lead to an increase in their release. When performing physical training, The muscles need more oxygen consumption and this huge increase in

oxygen consumption leads to an increase in free radicals as waste of the oxygen leaking from this process to the extent that the balance is disturbed. between its composition and antioxidants that makes the athletes more susceptible to disease and thus affect the level of his performance and achievement, which has motivated many researchers to be interested in studying the effect of different types of effort in releasing (liberating) free radicals and their antioxidants.

The ntioxidants to protect the body's cells from the danger and destruction of free radicals, giving them the electron they are looking for and which they lost in chemical reactions and the oxidation process until they become stable and neutral. Antioxidants consist of some enzymes that the body makes and some nutritional elements. Which humans eat in their daily food, and all of the antioxidant elements work together or individually against stray oxygen atoms.

The basic function of antioxidants is to prevent the process of cellular oxidation that results in free radicals (which are every atom that has lost an electron to become chemically neutral or extremely unstable and search for an electron to achieve its balance and stability, so it combines with compounds Others tear apart its structure, which is the components of the cell It damages , crashes and destroys it, and destroys it, but God Almighty provided the electron that these dangerous free radicals are looking for in antioxidants are found in plants and vegetables created by God Almighty and from what emerges from the earth. (Kostaropoulos et al., 2006)

There are still few recent scientific studies on the effect of high, medium and low intensity swimming exercises on antioxidants in the blood, as they found that these exercises lead to the formation of free radicals through the consumption of O2, and at the same time the body also produces the antioxidants necessary for this formation.

Among these studies is the study (Kostaropoulos et al., 2006). The study aimed to compare the adaptive responses to antioxidant mechanisms and oxidative stress in the blood between long- and short-distance runners.

Kostaropoulos, et al., 2006, 611-616) and the study (Pu-his, et al., 2004) (Changes in blood lipid peroxidation after a single session of strenuous exercise) This study aimed to determine the changes in lipid peroxidation and antioxidants in the blood after different stress levels.

Based on what was mentioned above, our current study dealt with the issue of swimming in two different efforts and its effect on a number of antioxidants, as

they represent reflections of free radical activity that have a negative impact on the health of the individual, and as it is an imperceptible problem facing athletes all over the world, whether in events that require a long period of time. Relatively (aerobic effort) or activities that require a relatively short period of time (anaerobic effort)

2-1 Research problem

By reviewing research and studies, we found that most of them focused on the responses of oxidation markers and antioxidants to continuous aerobic effort and in various sporting events, while it was noted that there is a scarcity of research and studies that dealt with the responses of oxidation markers and antioxidants to anaerobic and aerobic effort in an aquatic environment in triathlon event and this is what motivated us to study Response of some antioxidants to two stresses (aerobic and anaerobic) in an aqueous environment

1-3 Research objective

The research aims to identify the differences between some antioxidants after swimming 50 meters and 400 meters freestyle

1-4 Research hypothesis

The researcher assumed that there would be significant differences between some antioxidants after swimming 50

1-5 Definition of terms:

1-5-1 Antioxidants

The body generates or is provided with defense systems that work to resist the harmful effects of free radicals constantly formed in the body. These defense systems are called antioxidants, and these antioxidants may be produced internally or supplied from external sources (Irshad & Chaud, Huri 2002)they are molecules that reduce harm. It is disruptive to the oxidation process in biological molecules (Cosknn et al. 2004, 145-154), so it constitutes a line of defense against the destructive activity of free radicals in terms of their generation or chain of reactions (Prakash & Soshi, 2004, 5110) Antioxidants are known as substances that are present in low concentrations compared to the basic oxidizing substances and work to inhibit the oxidation process. (Fernundes & Videla 1996, 177).

2- Search procedures

2-1 Research methodology

The researcher used the causal-comparative approach to suit the nature of the research.

2-2 The research community and its sample

After the researcher identified the research community in a deliberate manner with the players of the Nineveh Governorate swimming team, which numbered (30) players, the youth group, which numbered (10) players, was selected from this community in a deliberate manner. The percentage of the research sample selected from the total research population reached (33.33%). .

2-3 Homogeneity of the research sample

Homogeneity was performed in the four variables (height/age/weight/training age) as in the following table:

Table (1)

It shows the values of the factorial mediation, the Frank deviations, and the various coefficients for the variables in which the reform was performed

Statistical means / variables	mean	standard deviation	coefficient of variation
Age/year	16.76	0.56	3.34
Height / centimeter	169	7.85	4.64
Weight/kg	56.32	6.89	12.23
Training age/year	6.65	1.23	18.49

Table (1), showing the values of the coefficient of variation for the variables (age, height, weight, and training age). This indicates that the sample is homogeneous. If the value of the coefficient of variation is less than (30), this is why the sample is considered homogeneous

2-3 Means of collecting data and information

- Measurements and tests

- Technical devices

- Scientific sources

2-3-1 Physical measurements

2-3-1-1 Height measurement (cm)

The lengths of the research sample members were measured using a height and weight measuring device (Detecto). The tester stands on the base of the device barefoot, and the person carrying out the measurement lowers a small metal plate on the tester's head from the metal stand. The number at which the pointer stands represents the tester's length in centimeters to the nearest (0.5) cm.

2-3-1-2 Weight measurement (kg)

The weights of the research sample members were measured using a height and weight device (Detecto). After waiting for the device to beep, the tester stands on the base of the device barefoot while wearing only sports pants. The reading is done after the electronic counter is fixed to a number representing the tester's weight in kilograms to the nearest (0.5).) kg, m

2-3-2 Biochemical tests in blood serum

The blood samples were examined in the laboratory of Dr. Radwan Al-Jammas, located in Al- masarif District, as follows:

2-3-2-1 Estimating the level of malondialdehyde (MDA) in blood serum.

The modified thiobarbituric acid (TBA) reaction method was used. In this method, the concentration of malondialdehyde (MDA) in blood serum is calculated, which represents one of the main products of the fat peroxidation process, and its concentration is an indicator of this process, as this method depends on the interaction between fat peroxides. Mainly (MDA) with acid (TBA). This reaction takes place in an acidic medium and produces a colored product, and its absorbance intensity was measured at a wavelength of (532) nanometers.

2-3-2-2 Estimating the effectiveness of the enzyme superoxide dismutase in blood serum

Super Oxide Dismutase (SOD)

The activity of the SOD enzyme in blood serum was estimated using a ready-made tests kit (Kit) owned by the company. (@BiolaboSafrance)

2-3-2-3 Estimating the effectiveness of the catalase enzyme (CAT) assay in serum

The effectiveness of the catalase enzyme in blood serum was estimated using several ready-made tests modified according to the solutions necessary to determine the effectiveness of the catalase enzyme.

2-4 Devices and tools

- American-made Detecto Medical scale for measuring weight and height

- Stopwatch

- Medical injection of 5 ml

- Medical cotton and sterile materials

- Tubes of (10) ml

- Pendorf tube for storing serum with a size of (1.5) ml

- A device for withdrawing serum after separation (Micro Paipet)

- Medical adhesive tape

A tornka is used to tie it to the upper arm area when drawing blood

- Plastic containers (Tips) to store sample forms.

- A box container for storing and transporting blood.

- Sensitive electronic scale

2-5 Medical test

A medical examination was conducted by a specialist doctor to ensure that the research sample was free of diseases that could affect the research variables.

2-6 The Exploratory experiment

The Exploratory experiment was conducted on Thursday, January 31, 2024, at exactly 3:00 pm, and it took two hours for the research sample This experiment aimed to familiarize the research sample with the devices and tools used, as well as measuring all research variables, identifying the nature of the experimental procedures by the research sample and assistants, and identifying the obstacles that the researcher may face when implementing

main experiment Water temperature °(C29) and environment temperature °(C29)

2-7 The first main experiment

The first main experiment took place on Friday (1/١1/2024) in the closed swimming pool of the Water Towers City, where the water temperature was (28°C) and the environment temperature was (30°C). The experiment took an hour and began at exactly (3:00) in the afternoon. It ended at exactly 4:00 and is as follows:

- The player warmed up for (15) minutes outside and inside the pool.

The player swam 50 meters freestyle.

The performance time was calculated using a digital stopwatch.

- After the player left the pool, he was helped to sit on a chair near the pool, and a blood sample was drawn by a specialist.

The blood samples were placed in special boxes and taken to the laboratory to test them and get results

2-8 for the second main experience

The second main experiment was conducted on Monday, November 4, 2024, where the same procedures as the first main experiment were repeated under the same conditions, but the swimming distance was (400) meters.

2-9 Statistical methods

The researchers used the following statistical methods:

1- Arithmetic mean 2- Standard deviation 3- (t-Test) for related samples 4- Coefficient of variation.

The statistical package (SPSS) version (11.0) was used for the purpose of processing the data statistically.

3-1- Presentation and discussion of the results

3-1-1 Displaying the results of the pre- and post-tests for the (50) meter freestyle swimming test

Table (2)

It shows the arithmetic means, standard deviations, calculated (t) value, and degree of significance for the pre- and post-tests of 50-meter freestyle swimming.

Variables	Unit of measurement	Pretest		Posttest		t-test	Probability	Moral
		x	s	x	s			
MDA	µmol/L	2.89	1.27	٤.٠١	٠.٦٥	٣.٣٧-	0.006	significant
SOD	nanograms/ml	62.43	0.98	٤١.٨٢	١.٨٥	٣٤.٥٠	0.000	significant
CAT	nanograms/ml	57.21	1.21	149.3	١.٩٦	١٤٠.٦٩-	0.000	significant

*Significant when error rate ≥ 0.05

It is evident from Table (2) that there are significant differences in the level of malondialdehyde, the level of superoxide dismutase, and the level of catalase between the pre- and post-tests of (50) meter freestyle swimming at a significance level (≤ 0.05).

4-1-2 Presentation of the results of the pre- and post-tests for swimming (400) meters freestyle

Table (3)

It shows the arithmetic means, standard deviations, calculated (t) value, and degree of significance for the pre and post tests of 400 meter freestyle swimming.

*Significant when error rate ≥ 0.05

Variables	Unit of measurement	Pretest		Posttest		t-test	Probability	Moral
		x	s	x	s			
MDA	µmol/L	2.89	1.27	3.38	0.48	-3.65	0.000	significant
SOD	nanograms/ml	62.43	0.98	46.98	4.87	11.12	0.000	significant
CAT	nanograms/ml	57.21	1.21	57.13	1.98	4.33	0.000	significant

It is clear from Table (3) that there are significant differences in the level of malondialdehyde, the level of superoxide dismutase, and the level of catalase between the pre- and post-tests of (400) meter freestyle swimming at a significance level (≤ 0.05).

4-1-3 Display the results of the two post-tests for the (50) and (400) meter freestyle swimming

Table (4)

It shows the arithmetic means, standard deviations, the calculated (t) value, and the degree of significance for the two post-tests of (50) and (400) meter freestyle swimming.

Variables	Unit of measurement	Pretest		Posttest		t-test	Probability	Moral
		x	s	x	s			
MDA	µmol/L	4.01	0.65	3.38	0.48	-2.21	0.070	Insignificant
SOD	nanograms/ml	41.82	1.85	46.98	4.87	3.32	0.000	significant
CAT	nanograms/ml	149.3	1.96	57.13	1.98	-120.40	0.000	significant

*Significant when error rate ≥ 0.05

It is evident from Table (4) that there are no significant differences in the level of malondialdehyde and that there are significant differences in the level of disimotizo sopraxide and in the catalase level between the two post-tests of (50) and (400) meter freestyle swimming at a significance level (≤ 0.05).

4-2 Discussing the results

It is clear from the previous tables that there was an increase in the level of (MDA and (CAT) after swimming (50) meters freestyle. The researcher

attributed this increase to the increase in oxygen consumption during muscle activity, which produces more free oxygen radicals than at rest, in addition to the need for oxygen after swimming as a result of oxygen debt. Where (Marai, 2012) mentions, citing (Clarkson, 1995) The increase in oxygen consumption during metabolic activity increases the leakage of electrons from the transport system in the mitochondria and causes an increase in the formation of free radicals and thus an increase in the level of lipid peroxidation represented by (MDA), accompanied by an increase in the level of (CO2) and lactic acid (Marai, 2012, 65).

This study is consistent with what was stated by (Kanter et al., 1988), as they indicated that the level of (MDA) increases after any effort, and that the increase in the level of (MDA) is evidence of fat peroxidation. ((Kanter et al., 1988, 60-63)

It is also consistent with the findings of (Kostaropoulos, et al., 2006), where he pointed out that in exercises with a short duration and high intensity, such as short-distance races, runners are exposed to a state of oxidation in the blood and an increase in the activity of the catalase enzyme to a lesser extent than long-distance runners. Because long-distance runners have a high tolerance for aerobic effort due to their long-term exercise, and there is a positive relationship between VO2 max and catalase activity In addition to the simple damage to muscle and other tissues that is usually caused by high-intensity exercises, which may also cause minor infections, which requires the mobilization of white blood cells that produce effective types of oxygen to eliminate bacteria that may cause infections (Fridovich, 1988, 363.)

As for superoxide dismutase (SOD), Table (2) shows that there are significant differences for the antioxidant enzyme superoxide dismutase (SOD) between the two pre- and post-tests immediately after swimming (50) meters freestyle, as the level of (SOD) decreased in the post-test directly for the test sample. Compared to the post-test, the researchers attribute this decrease to the fact that it is normal for lactic acid to accumulate in the blood after anaerobic effort, and it may take a period of time. Remove it (1-2) It is also normal for its effect to decrease the activity of the enzyme superoxide dismutase (SOD) to remain for the period required to remove lactic acid from the blood.

This is consistent with what was stated by (Pu-his, et al., 2004), where they indicated that there was a decrease in the level of (SOD) immediately after the effort compared to the pre-test.

As for after swimming (400) meters, the reason for the increase in the MDA level is attributed by the researcher to the increase in oxygen consumption during muscle activity, which produces more free oxygen radicals than at rest The need for oxygen after aerobic effort due to oxygen debt. Marei, 2012, citing (Clarkson, 1995), mentions that high oxygen consumption during metabolic activity increases the leakage of electrons from the transport system in mitochondria and causes an increase in the formation of free radicals, and then an increase in the level of lipid peroxidation represented by (MDA). This is accompanied by an increase in the formation of free radicals. Level of CO2 and lactic acid (Marai, 2012, 65).

As for the decrease in the level of the enzyme superoxide dismutase, researchers believe that aerobic metabolic activity will increase significantly after completing a 400-meter freestyle swim to remove the waste of effort, neutralize excessive oxidative effort, and return the body to a state of bodily balance (homeostasi). This leads to a decrease in the level of the enzyme superoxide dismutase. Desmutase (SOD)

(Wade, et al., 2007) mention that there is a significant correlation between the speed of metabolic processes and the production of free radicals, and that the accumulation of free radicals during exercise may lead to an inhibition in a number of enzymatic antioxidants, especially (SOD), due to the increased production of active oxygen species. (ROS) resulting from physical activity, which leads to a decrease in the effectiveness of the enzyme (SOD) and thus a decrease in its level due to its breakdown (Wade et al., 2007, 283). As for catalase (CAT), researchers believe that aerobic metabolic activity will increase significantly after completing aerobic effort to remove the waste of effort, neutralize excessive oxidative stress, and return the body to a state of homeostasis, and this leads to a decrease in the level of these two enzymes. It is mentioned (2007 et al., Wadi,) in that there is a significant correlation Between the speed of metabolic processes and the production of free radicals, the accumulation of free radicals during exercise may lead to an inhibition in a number of enzymatic antioxidants, especially (CAT), due to the increased production of active oxygen species (ROS) resulting from physical activity, which leads to a decrease in the effectiveness of the enzyme (CAT). and thus its level decreases due to its disintegration (Wade et al., 2007, 283) This study is consistent with the findings of (Marzatico, et al., 1997), where he indicated that running relatively long distances, such as a marathon, leads to a decrease in some of the enzymatic antioxidants, including catalase (CAT), for a period of (48) hours.

As for the decrease in the level of (SOD) in the effort of swimming (50) meters freestyle to a greater extent than it is in swimming (400) meters freestyle, this is attributed to the fact that in swimming (50) meters freestyle, lactic acid accumulates significantly after it. It is greater than the accumulation in swimming (400) meters, as mentioned (Abdel Fattah et al., 2005). In activities that depend on the lactic acid system, with high intensity and a longer duration that ranges between (1-3) minutes and repetitive, such as boxing rounds, judo, and middle-distance running races, the main reason for the increase in free radicals is lactic acid itself. Therefore, some types of free radicals are formed during physical performance, although most of them are formed at the end of this stage. (Abdel Fattah et al., 2005, 30-31) This study agrees with what was stated by (Pu-his, et al., 2004), (2007 et al., K.M. DIAZ), where they indicated that there was a decrease in the level of (SOD) in the post-measurement directly compared to the pre-measurement. . (Pu-his, et al., 2004), (2007 et al., K.M. DIAZ)

It also agrees with the findings of (Pu-his, et al., 2004), who indicated that a test on a moving treadmill consisting of five stages with a gradual increase in speed, each stage performed individually, significantly increases the level of (MDA). 77, (Pu-his, et al., 20-77) As for the reason for the rise in CAT after swimming (50) meters and its decrease after swimming (400) meters, it is attributed to the fact that after swimming (400) meters, aerobic work will increase significantly to remove effort waste, neutralize excessive oxidative stress, and return the body to a state of physical balance, and this is what leads to a decrease in the level of the enzyme (CAT), and it is mentioned (Wade, 2007 et al.) that there is a significant correlation between the speed of metabolic processes and the production of free radicals, and that the accumulation of free radicals during exercise may lead to inhibition of a number of enzymatic antioxidants, especially ((CAT)

Due to the increased production of active oxygen species (ROS) resulting from physical activity, which leads to a decrease in the effectiveness of the enzyme (CAT) and thus a decrease in its level due to its disintegration. (Wade et al., 2007, 283).

This study is consistent with the findings of (Marzatico, et al., 1997), who indicated that running relatively long distances, such as a marathon, leads to a decrease in some of the enzymatic antioxidants, including catalase (CAT), for a period of (48) hours.

5- Conclusions and recommendations

5-1 Conclusions

1- The increase in malondialdehyde levels after swimming the 50-meter freestyle is more than the 400-meter freestyle

2- Decrease in the level of superoxide dismutase after swimming the 50-meter freestyle greater than the 400-meter freestyle.

3- The level of catalase increases after swimming 50 meters freestyle and decreases after swimming 400 meters freestyle

5-2 Recommendations

1. Take some supplements when training sports to reduce the damage caused by the accumulation of free radicals. These plants include fenugreek, ginger, red pepper, pomegranate juice, grapes, and others.

2. Conducting a study on the recovery of some enzymatic antioxidants after exertion

3. Conducting other studies on the effect of aerobic and anaerobic effort on those practicing sports activity after giving them some types of antioxidants, such as some vitamins, and measuring the extent of their effect on fat peroxidation and other antioxidants.

References:

1. Abdel Fattah, Abu El-Ela Ahmed and others (2005): Safe sports performance, free radicals, and antioxidants, 1st edition, Dar Al-Fikr Al-Arabi, Cairo.
2. Marei, Riyad Akkab Marei (2012): The effect of aerobic effort at moderate and high temperatures on a number of antioxidants and fat peroxidation among those practicing sports activity, M.A thesis, College of Basic Education/Department of Physical Education, University of Mosul.
3. Clarkson, pm. (1995): Antioxidants and physical performance, critical reviews in food Sçèce and Nutrition 35:131-41.
4. Fridovich (1988) :Superoxide dismutase: the first twenty years (1968-1988), Free Radic. Biol. Med. 5 (5–6): 363–9.
5. Kanter, M.M., Lesmes, G, R., Kaminsky, La., Hamsaeger J. and Nequin ND. (1988): Serum Creatine Kinase and Lactate Dhydrogenase Changes following an Eighty Kilometer Race, Eur J Appl Physiol (57): 60-67.
6. Kostaropoulos, M.G., Nikolaidis, A.Z., Jamurtas, G.V., Ikonomou, V., Makryglannis, G., Papadopoulos ،D., Kouretas. (2006): Comparison of the Blood Redox Status Between Long-Distance and Short-Distance Runners, Physiol.Res.(55)
7. Marzatico J., Blood free radical antioxidant enzymes and lipid peroxides following long–distance and lacticaemia performances in highly trained aerobic and sprint athletes, J Sports Med Phys Fitness. 1997 Dec;37(4):235-9.
8. Coskun, O., Ocakci, A., Bayraktaroglu, T. and Kater, M. (2004) Exercise and B-cell damage in rat pancreas. Tohoku J. Exp. Med., 203(3): 145-154.
9. Irshad, M. and Chaudhuri, P.S. (2002): Oxidant antioxidant system. Role and significance in the human body, Indian.J.Exp.1233-1239.

10. Fernandes,V;Videla,LA.(1996): Biochemical aspects of cellular antioxidant system, Biol. 29 (20) : 177.

11. Pu-hsi Tsai1, Nean-been Kan1, Chieh-chung Liu1, Ming-lang Jeng, Su-chen He, and Chih-cheng Lin1. (2004): Changes IN blood Lipid Peroxidation Markers after a Single bout of Exhaustive exercise, Annual Journal of Physical Education and Sports Science.77-86.

12. Wade L., Knez, David G., Jenkins, and JEFF S., Coombes. (2007): Oxidative Stress in Half and Full Ironman Triathletes, Copyright @ 2007 by the American College of Sports Medicine. Unauthorized reproduction of this article is prohibited.