The Effect of Whey Protein on health, delay fatigue, and improve performance of long-distance swimmers

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Abstract

This study aimed to describe the effect of Whey protein on health, delay fatigue, and improve the performance of long-distance swimmers.

Materials and methods: Using the experimental method of pre-post analysis. We chose (14) long-distance swimmers for the study. We treated whey protein for two months at a dose level of 1.6 grams/kg b.w, where we collected blood samples in centrifuge tubes before and after Whey protein ingestion at rest. This was after an 800meter swim to detect immunoglobulins (IgG, IgA, IgM), SoD, glutathione reductase, Malondialdehyde together with LD, creatine kinase, Na+ and prolactin, and Wbcs. The results indicated that high antioxidants and immunoglobulin were remarkable. And a decreased Malondialdehyde after Whey protein administration, lactate dehydrogenase (LD), creatine kinase, and Na+ decreased after Whey protein ingestion.

Conclusion: Whey protein induced several benefits as it showed improvement in immunity, delayed fatigue, and also improved physical performance and score level of long-distance swimmers.

Keywords: Long-distance swimmers, Whey protein, fatigue, immune response, physical performance

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Introduction

A component of the integrated nutrition strategy is the use of sports supplements. Research shows that sports nutrition supplements can improve mental and physical performance in addition to the well-known advantages of good health.

We employed a plethora of supplements, including branch-chain amino acids, carnitine, whey protein, ephedrine, prohormones, and protein caffeine. According to Hatfield (2013), branched-chain amino acids (BCA AS) have several advantages:

- Enhances stamina.

Avoids weariness.

It does two things:

(1) boosts energy levels and

(2) enhances cognitive function.

He also added that (BCAAS) is composed of three amino acids: Leucine, Isoleucine, and Valine, as they are to retain a positive nitrogen balance and replace the BCAAS that are lost through energy expenditure. It is recommended that Leucine, at the double rate of the two other BCAAS, must be taken on an empty stomach before and after the workout. Data indicated a significant benefit in blood components and energy metabolism together with delay fatigue. This was also reported by (Barrett et al., 2010).

Whey protein is a supplement used by athletes in different fields to improve health. Due to its Branched Chain Amino Acids content, it Maintains the mental and nervous system due to phenylalanine. Also, tryptophan relieves moderate depression arginine for growth hormone stimulation, and glutamine, boosts the immune system, maintains

muscle mass, and aids recovery from exercise. It also contains Proline which speeds up injury repairs together with promoting tissue recovery. Whey protein promotes health, induces growth, and may delay fatigue and improve performance (Hatfield, 2013).

BCAAS has been shown to boost the immune system, composed of WBCs, immunoglobulin, and immune hormones. These, in turn, defend the body, which is an open system and continuously called upon to defend itself from potentially harmful invaders such as bacteria and viruses.

Wbcs comprise neutrophils, eosinophils, basophils, lymphocytes, and monocytes. Immunoglobulin is also called humoral immunity composed of IgG, IgA, IgM, IgD, and IgE. Also, there are different cytokines such as interleukins and Interferon (Ganong, 2000-Guyton and Hall, 2006).

Fatigue might be one of the stresses affecting athletes, including swimmers, and it is a loss of ability to continue physical workouts or performance.

Researchers reported many causes of fatigue that include depletion of acetylcholine salts and accumulation of deficit in the muscles. It had potassium, a decreased source of energy or dehydration, Ph decrease, or even some chemical substances found in the blood as heat shock protein, creatine kinase, some blamed lactate, lactate dehydrogenase, or stress hormones as prolactin (Reilley et al. 2008-Mougins, 2006).

Fatigue is a multi-factorial cause, which may affect all athletes in different sports, and its adverse action can decrease fitness and affect health and mental state. So, this study aimed to explore the effect of Whey protein on health, delay fatigue, and improve the

performance of long-distance swimmers.

It is hypothesized that Whey protein might cause a significant improvement in health, delay fatigue, and improve the performance of long-distance swimmers.

Research Procedures

Research methods: the researcher used the experimental method due to the suitability of the nature of the study.

Researcher sample

(14) long-distance swimmers were chosen from Port-Said clubs to participate in the study, (14) swimmers for the main study, and (4) swimmers for the pilot study.

Table (1) basic measurements of participants

Variables	Mean	SD	Skewness
Age (years)	17.9	2.6	0.71
Height (cm)	178.4	5.7	0.84
Weight(kg)	69.4	5.9	0.56
Training experience(y)	8	1.5	0.75
BMI (kg/m²)	20.1	2.2	0.38

Skewness was between (±3) indicating homogeneity of the sample.

Pilot study:

(4) The pilot study included swimmers who were able to cover vast distances. The pilot study, which took place three days before the main study, aimed to explore the devices and equipment to identify any potential issues that may arise during the research. The participants came from the same community as the primary sample.

The results showed that everything was well-prepared.

Before the main study:

- The swimmers refrained from caffeine. They were subjected to

800-meter crawl swim.

- Blood sample was drawn before and after an 800-meter swim.

Tools used:

- Syringes, sterile tubes with covers.

- Pulse meter for pulse rate determination.

- 800-meter crawl swims before and after the Whey investigation.

- Radial plates for immunoglobulin.

- Kits for hormone, Elisa technique.

- Kits for antioxidants and Malondialdehyde.

- Kits for lactate dehydrogenase.

- Microscope for WBCS evaluation.

- Creatine kinase kit and spectrophotometer.

(Breanna, 2021) recommended 1.6 grams per kg body weight, and each swimmer ingested the dose for a month/ daily.

Statistical analyses:

Using (SPSS) including:

- Arithmetic Mean, standard deviation.

- T-test for comparison before the ingestion of Whey Protein and after the experiment.

- Level of significance at 5% ($P>0.05$).

Results

Table (2) revealed that variables pulse rate, lactate dehydrogenase, and creatine kinase Na+ decreased after Whey ingestion at rest and after an 800-meter swim together. Prolactin decreased after Whey ingestion at rest after the swim.

Table (3) recorded that immunoglobulin IgA, IgG, and IgM increased concentration after Whey ingestion at rest after an 800-meter swim, also Wbcs increased after Whey ingestion at rest after an 800-meter swim.

Table (4) showed that glutathione reductase SOD concentrations increased after Whey ingestion at rest and 800meter swim, while Malondialdehyde decreased concentration at rest and after 800meter swim. Table (5) records level in minutes decreased after Whey ingestion for 2 months.

Results:

Table (2)EFFECT of exhaustive exercises (800meter swim) on some variables before and after Whey ingestion

Variables	Before Whey		After Whey		Sig
	M	SD	M	SD	
Pulse Rate (c/min) Rest after exercise	77.6	3.3	68.2	2.8	*
	166.4	7.1	152.2	5.1	*
Lactate dehydrogenase Rest after swim (IU/L)	77.3	4.2	60.2	4.3	*
	124.2	7.1	108.6	6.2	*
Creatine kinase Rest after swim (IU/L)	39.2	3.1	25.6	2.5	*
	50.6	4.3	45.3	3.1	*
Na^+ Rest (meg/L) after swim	153.2	5.8	149.1	3.9	*
	139.4	4.6	135.2	3.1	*
Prolactin (meg/L) Rest after swim	30.2	3.8	26.8	3.2	*
	42.6	4.2	31.3	3.5	*

$P<0.5$

Significant changes of variables at rest and after exercises before and after Whey ingestion of swimmers.

Table (3) Effect of exercises on some variables before and after Whey ingestion

Variables	Before Whey		After Whey		Sig
	M	SD	M	SD	
IgA Rest (mg/dl)	120.3	6.7	256.1	7.8	*
After exercise	109.6	5.2	242.2	6.1	*
IgG Rest (mg/dl)	750.7	12.2	1104.3	13.6	*
After exercise	731.4	9.6	956.4	11.3	*
IgM (mg/dl) Rest	74.3	5.2	116.4	6.8	*
After exercise	62.7	4.4	89.2	5.6	*
Wbcsul Rest	5200	203	7320	23.1	*
after swim	4880	16.4	5008	17.5	*

P<0.05

Significant changes of variables at rest and after exercises before and after Whey ingestion.

Table (4) Effect of exhaustive exercises (800meter swim) on glutathione reductase, superoxide dismutase, and Malondialdehyde before and after Whey ingestion

Variables	Before Whey		After Whey		Sig
	M	SD	M	SD	
Glutathione reductase rest (mg/dl)	31.6	2.7	46.3	4.5	*
After exercise	27.9	2.4	42.7	3.8	*
Superoxide dismutase Rest (mmol/ml) After exercise	4.8	0.7	6.4	0.8	*
	4.1	0.5	5.5	0.9	*
Malondialdehyde (mmol/ml) Rest	3.8	0.8	2.7	0.6	*
after exercise	4.9	1.3	3.6	0.9	*

P<0.05

Significantly increased antioxidants after Whey ingestion and significantly decreased Malondialdehyde after Whey ingestion.

Table (5) effect of 800meter swim on score level after Whey ingestion

Variables	Before Whey		After Whey		Sig
	M	SD	M	SD	
Score level (min)	11.2	0.3	10.8	0.5	*

P<0.05 Significant improvement of score level after Whey ingestion.

Discussion

According to Tables (2,4), swimmers benefit from consuming whey protein due to an increase in physical efficiency and a marked decrease in pulse rate both at rest and after an 800-meter swim, as compared to before ingestion.

One of the most important factors in human health is physical efficiency, which is defined as the ability to do tasks without showing signs of being tired (Hunters et al., 2003). Physical exercise has a well-documented positive effect on the body's overall efficiency.

Reduced heart rate frequency is a result of deliberate and methodical physical exercise. An individual's capacity to exert effort and the efficiency with which their tissues and organs function are both enhanced through aerobic exercise and other forms of physical training that promote greater maximal oxygen uptake.

Physical fitness and health both reduce the risk of cardiovascular disease, according to a number of studies. Those who achieve and maintain an adequate level of physical fitness do so by following sensible exercise and nutrition regimes. Modifications to lower blood pressure and heart rates decrease the risk of cardiovascular disease and cerebrovascular accidents. Also, when they're sick, fit athletes can draw on more of their body's reserves.

Consequently, maintaining a healthy body is essential for a long and fruitful life (Heshmat et al., 2013).

Following the 800-meter swim, there was a marked increase in lactate dehydrogenase concentration and an elevated creatine kinase level, as shown in Table (2). Lactate plus was found to be more concentrated as the concentration of lactate dehydrogenase rose. A higher quantity of hydrogen ions indicates that the muscle is more acidic. There may be more muscle injury if creatine kinase levels are higher. In contrast, consumption of whey reduced muscle damage and levels of creatine kinase and lactate dehydrogenase.

There is an association between lactate plus H ion concentration and muscular tiredness, as documented by (Kuipers 1994) (Clarkson et al., 1992) (Sorichter et al., 1999). Chronically stressed skeletal muscle exhibits abnormally elevated concentrations of biochemical components such as lactate, creatine kinase, activated enzymes, and lactate dehydrogenase, and greater concentrations of creatine kinase are related with muscle damage from longer duration exercises.

Table (2) shows that by the end of the 800-meter swim, the mineral determination of sodium had dropped. They may be losing minerals through perspiration after consuming whey, as salt levels drop both at rest and during exercise.

According to a study by Clausen (2003), athletes have been known to lose up to five pounds in just one hour when competing in hot and humid physical endurance competitions. According to Tanaka and Seals (2003), it has long been recommended that athletes consume sodium chloride pills before exercising on hot and humid days since sweat includes a significant amount of this mineral.

After a strenuous workout, mineral concentrations drop, which could be because of sodium loss, which could induce muscle weakness, or an overabundance of aldosterone, which could cause hypokalemia (Heshmat et al., 2013; Besser and Thorner, 2002; Boldyreff and Wehling, 2004).

According to Table (2), the concentration of prolactin was higher after an 800-meter swim as compared to the concentration when at rest. This suggests that the anterior pituitary gland's released prolactin hormone could be a measure of exhaustion that is sensitive to exercise stress. After consuming whey, prolactin levels dropped at rest and following an 800-meter swim.

[Hunters et al., 2003] According to research (Gratachea et al., 2007; Robergs et al., 2007), exhaustion from strenuous physical labor is a natural result of the body's constant need to replenish lost energy. After a workout, your body uses more energy, according to the research. This is associated with the exercise volume and its variations, including but not limited to: muscle group targeted, equipment used, number of reps and activities performed, time to execute load, sequence of exercises, and rest intervals between sets.

Energy consumption during exercise is related to exercise stress, which includes weariness and prolactin secretion (Goffin et al., 2002; Freemen et al., 2014).

The effect of Whey protein ingestion on health is expressed as immune functions such as the effect on Wbcs, immunoglobulin, and oxidant (Malondialdehyde) and antioxidants (superoxide dismutase and glutathione reductase) determined at rest and after an 800meter crawl swim.

Table (3) revealed a significant increase in Wbcs number/ml after Whey protein ingestion at rest and an 800meter swim together with a substantial

increase in concentrations of immunoglobulin IgG, A, M, after Whey protein ingestion at rest and after an 800meter swim.

Table (4) indicated that Whey protein ingestion increased significant antioxidants glutathione reductase and superoxide dismutase while Malondialdehyde decreased significantly after Whey protein ingestion at rest and 800meter swim.

O2 activation can take place in several parts of the cell because superoxide anions can be formed anywhere an electron transport chain is present. That SODs are present in all these sub-cellular sites, including the roots of plants that scavenge these radial species, should come as no surprise (Mougios, 2006).

Whey protein supplementation reduced the production of free radicals (O2, OH, and H2O2) by increasing superoxide dismutase (SOD) activity and decreasing malondialdehyde, as shown in Table 4. Hatfield (2013) cites research by Mohamed Kamel et al. (2014).

Whey protein shown SOD activity in this investigation. This enzyme can be utilized by other antioxidants such as glutathione peroxidase and catalase by converting O2 into H2O2. The results demonstrated that the Whey protein had a protective effect.

Whey protein delivery improved the reaction of antibody products IgG, IgA, and IgM, as seen in Table 3. The results show that the Whey protein was successful in getting the B-cells to make the desired antibodies.

Boosting inflammatory reactions results in the elimination of pathogens, as the production of antibodies is a part of particular immunity to cells. According to research in molecular biology and related fields, superoxide dismutase has a function in regulating oxidative stress in plants (Ganong

2000; Barrett et al., 2010). A person's health is improved and lipids and cholesterol are reduced when treated with whey protein, according to research (Guyton and Hall, 2006). Whey protein may also increase natural antioxidant activity.

The damage that reactive oxygen species (ROS) can inflict on biological molecules might be either temporary or permanent. Mutations in DNA, proteins, and phospholipids all have an effect on cellular processes and membrane dynamics (Murray et al., 2009). Many diseases, including cancer and inflammatory disorders, have been linked to the pathophysiology of reactive oxygen species (ROS) formation.

In a 2005 study by Chattarjea and Shinde, Showed that a more oxidative state transition can result in uncontrolled lipid peroxidation, protein oxidation, and ultimately cell death. Because of this, a great deal of research, like this one, needs to focus on identifying new compounds that provide protection against ROS. A number of substances are known to exert strong influences on the immune system. These include proteins, peptides, Whey protein, lipopolysaccharides, glycoproteins, and lipid derivatives.

The record level of 800-meter swim decreased significantly after Whey protein ingestion for 2 months, as Whey protein induced delayed fatigue due to its content of glutamine and branched-chain amino acid. It aids in recovery and retard fatigue and delayed muscle soreness and improves physical performance and score level. (Mac Intyre et al., 1995).

Conclusion:

Whey Protein supplementation may induce several benefits due to its content of many amino acids such as BCAAS, phenylalanine glutamine, and Proline plus protein that affect growth and build muscle. The

research revealed that Whey protein improved immunity due to the action of antioxidants delayed fatigue due to glutamine and BCAAS, which aids recovery and retard fatigue.

Also, Whey protein may improve physical performance and score level due to its protein action and growth hormone stimulation through arginine content and glutamine.

Recommendations

It is recommended to use Whey protein, a safe, natural supplement to improve health and physical performance for swimmers and other sports, as it is proven to be safe without side effects and has no doping effects.

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