Supplementation Of Ômega-3 In Practice Of Intense Physical Exercise

Suplementação De Ômega-3 Em Praticante De Exercício Físico Intenso

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Como citar:
Brito JVR, Jesus FM, Beserra JF, Eduardo AMLN. Supplementation Of Ômega-3 In Practice Of Intense Physical Exercise. REVISA. 2019; 8(2): 215-27. Doi: https://doi.org/10.36239/revisa.v8.n2.p215a227

REVISA

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Received: 20/04/2019
Accepted: 5/06/2019

RESUMO

Objetivo: analisar pesquisas acerca da suplementação com ácidos graxos poliinsaturados ômega-3 (AGPI-n3) em praticantes de exercícios físicos intensos (EFI). **Método:** Para a realização do estudo, foram consultados artigos disponíveis nas seguintes bases de dados eletrônicas: Scielo, PubMed, Lilacs, Revistas Científicas. Os estudos dos artigos consultados foram realizados em indivíduos adultos. **Resultados:** Foram identificados os artigos que se enquadravam no quadro de exigências de acordo com o objetivo desta revisão. Foram selecionados 10 artigos (n=10), de modo a investigar os itens de maior relevância, que foram: referência, revista, teste físico, grupo avaliado (número e gênero), quantidade de tempo e de suplementação e principais resultados. **Conclusão:** Os resultados evidenciaram que a suplementação com AGPI-n3 pode prevenir doenças cardíacas, alterar o metabolismo lipídico, suprimir marcadores inflamatórios em exercícios de resistência, melhorar a função pulmonar durante exercícios, aumentar a quantidade de ácido eicosapentaenoico (EPA) e docosahexaenóico (DHA) no sangue.
Descritores: Omega-3; EFI; Lesão muscular; Estresse oxidativo; Processo inflamatório.
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ABSTRACT

Objective: to analyze the research on supplementation with omega-3 polyunsaturated fatty acids (PUFA-n3) in intense physical exercise practitioners (EFI). **Methods:** For the accomplishment of the study, articles were available in the following electronic databases: Scielo, PubMed, Lilacs, Scientific Journals. The articles were consulted in adults. **Results:** The articles that fit the requirements framework were identified according to the purpose of this review. Ten articles (n = 10) were selected, in order to investigate the most relevant items, which were: reference, journal, physical test, group evaluated (number and gender), amount of time and supplementation, and main results. **Conclusion:** The results showed that supplementation with PUFA-n3 can prevent heart disease, alter lipid metabolism, suppress inflammatory markers in endurance exercises, improve pulmonary function during exercise, increase the amount of eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) in the blood.
Descriptors: Omega 3; EFI; Muscle injury; Oxidative stress; Inflammatory process.

Introduction

Fatty acids (AG) are organic elements that have 4 to 22 carbon molecules. Its classification is performed according to the existence of double bonds, called unsaturations, that are located between the carbon chains. However, saturated fatty acids (AGS) do not have double bonds. Monounsaturated fatty acids (AGMI) have an unsaturation, and finally, there are polyunsaturated fatty acids (PUFAs) with two or more unsaturations in their chain.[1]

In the 70's the first reports on the metabolism of Omega 3 fatty acids appeared, where some studies of cardiovascular diseases were developed, especially coronary disease.[2]

The 1980s were a period of expansion in the knowledge about PUFA in general and omega-3 fatty acids in particular, reports were made on a population of Eskimos in Greenland, since they consumed in high quantities, by the ingestion of cold water fish and such as trout, tuna and salmon, it was found that the Eskimos did not present high rates of coronary diseases, despite the high ingestion. [3-4]

They are also found in some plant seeds, such as flaxseed, where flax oil is extracted. Canola oil, walnut, and dark green leaves are also sources of omega-3 fatty acids.[2]

Supplementation with omega-3 polyunsaturated fatty acid, specifically DHA and EPA (which have anti-inflammatory action), in athletes can alleviate the consequences of the inflammatory process of the injured muscle by reducing the synthesis of chemical mediators of inflammation to reduce the time of response to the EFS. [1]

Performing low and medium intensity regular physical exercise (EFR) are recommended for disease prevention. Among the numerous benefits are the reduction of oxidants, improvement in the antioxidant defense system and increase of the resistance of the organs and tissues against the destructive action of free radicals (RL). However, there are scholars who say that EFI are directly linked to the occurrence of muscular damage, the exaggerated production of RL, decreased immune system efficacy, cardiovascular diseases, stress, altered lung functions, among others.[5-6]

According to Polisseni, (2014) intense physical exercise can be identified as repetitive body movements, affected by the musculoskeletal system that cause energy expenditure. They consist of a selection of exercises and modalities, there must be an order of exercises, training speed and frequency, number of sets, intensity and time of rest period. [5]

Supplementation with omega-3 polyunsaturated fatty acid (PUFA-n3) in EFI practitioners reduces the inflammatory process in the lesion by decreasing the synthesis of inflammatory mediators, causing the recovery time to be significantly reduced to the same time when there is a better response to exercise. [1]

With the goal of reaching the daily nutritional requirements of athletes and practitioners of intense physical exercise, the use of supplementation has increased radically in the last decade. Research has shown that several foods have natural elements that influence metabolism, and some may promote

improvement in the individual's physical performance, as well as prevent damage caused by EFI. Among these supplements that have been highlighted the most are omega-3 polyunsaturated fatty acid (AGPI-n3), attracting the attention of numerous researchers around the world.[6]

Based on the innumerable evidences of the benefits of PUFA-n3 supplementation, several researchers have investigated its effects on EFI practitioners, whether athletes or not. In view of the above, this study aims to carry out a literature review on the supplementation of polyunsaturated fatty acids omega 3 in intense physical exercise (EFI) practitioners.

Method

It is a bibliographical review research, through analysis of scientific publications on the supplementation of AGPI-n3, where original articles, monographs and dissertations were used, both national and international. Data were gathered from February to December 2018. The main databases acessed were: LILACS, PUBMED, SCIELO, and scientific journals. After data collection, studies were carried out on PUFA-n3 supplementation in EFI practitioners (intense physical exercise), with the subjects being athletes or not athletes. Some studies presented a double-blind methodology with placebo. The articles used were published between 2002 and 2017. The key words applied for search were: omega 3, EFI, athlete, muscle injury, inflammation, supplementation, resistance, fatty acids. To date, 37 articles on the topic have been used.

Theoretical Referential

Omega Polyunsaturated Fatty Acids 3 (Agpi-N3)

The human being is not able to produce the fatty acids, they are exclusively obtained through the diet, this occurs because the organism does not possess the necessary enzymes for the production of these acids, called desaturases. From the tip of the chain containing the methyl, the first double bond of carbon is counted. Hence the classification of omega 3, 6 and 9 fatty acids, which have different functional and structural characteristics (figure 1). Currently omega 3 has been highlighted due to the search of humans and is being the most studied of this group of acids. It has in its structure 18 carbons, 3 double bonds and the first double bond is on the third carbon from the methyl group.[7]

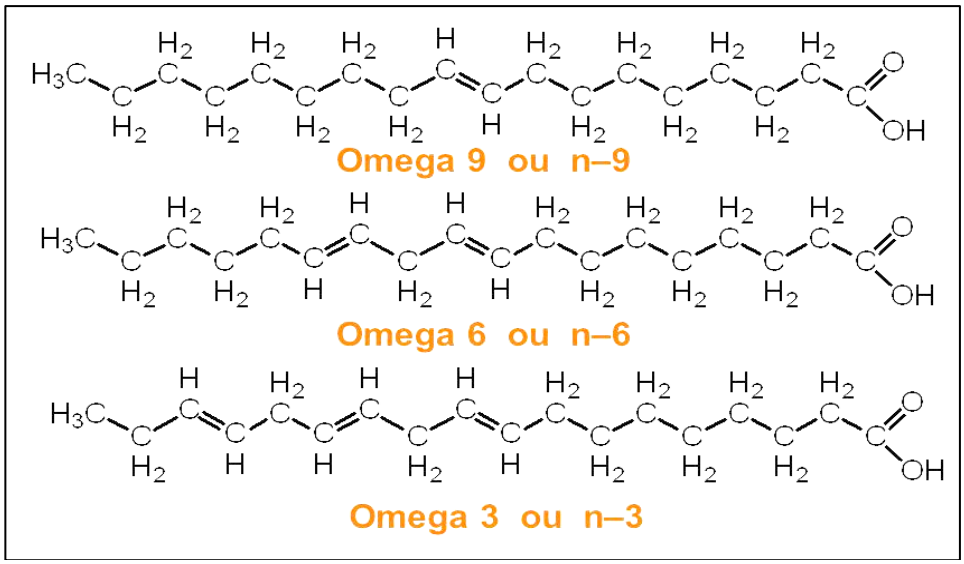

Figure l- Nomenclature of fatty acids.
Source: Instituto Federal de Santa Catarina, 2017.

Polyunsaturated fatty acids are divided into families, the most important of which are omega 3 (alpha linoleic acid) and omega 6 (linoleic acid), which are essential. The omega-3 polyunsaturated fatty acids (PUFA-n3) stimulate the production of lymphocytes, antibodies and cytokines. While omega-6 polyunsaturated fatty acids (PUFA-n6) act both as stimulators and suppressors of the immune system, their main function is inhibition.8 Both are essential for maintaining brain functions and cell membranes, under the normal conditions. [7]

In lipid metabolism, there is a conversion of PUFA-n6 to AA (arachidonic acid), its metabolites called eicosanoids are assigned biochemical mediators (prostaglandins series 2, thromboxane A and leukotrienes series 4) included in the inflammatory, infectious and cell and tissue injuries.9 Because of this, ω-6 is thought to influence the inflammatory process by suppressing the immune system, whereas ω-3 acts as an immunosuppressant.[7]

Omega 3 is a fat, ie a fatty, polyunsaturated acid, which is an essential component for the proper functioning of the body. It needs to be consumed because it is not produced naturally by the body. Omega 3 has the fatty acids EPA (Fatty acids eicosapentaenoico), ALA (alpha-linolenic acid) and DHA (Fatty acids docoexaenoico).[10-2] Metabolization of ALA to other compounds occurs by its desaturation (insertion of double bonds in the acyl chain), catalyzed by enzymes Δ5 and Δ6 desaturases, and by its elongation through the enzyme elongase. Thus, ALA (18: 3n-3) is converted to stearidonic acid (18: 4n-3) by the action of Δ6 desaturase and then elongated to eicosatetraenoic acid (20: 4n-3), which, in turn, is converted to eicosapentaenoic acid (20: 5n-3), or EPA, via Δ5 desaturase. EPA can be metabolized to docosahexaenoic acid (22: 6n-3), DHA, or to give eicosanoids via cyclooxygenases (COXs) (Figure 2).[11]

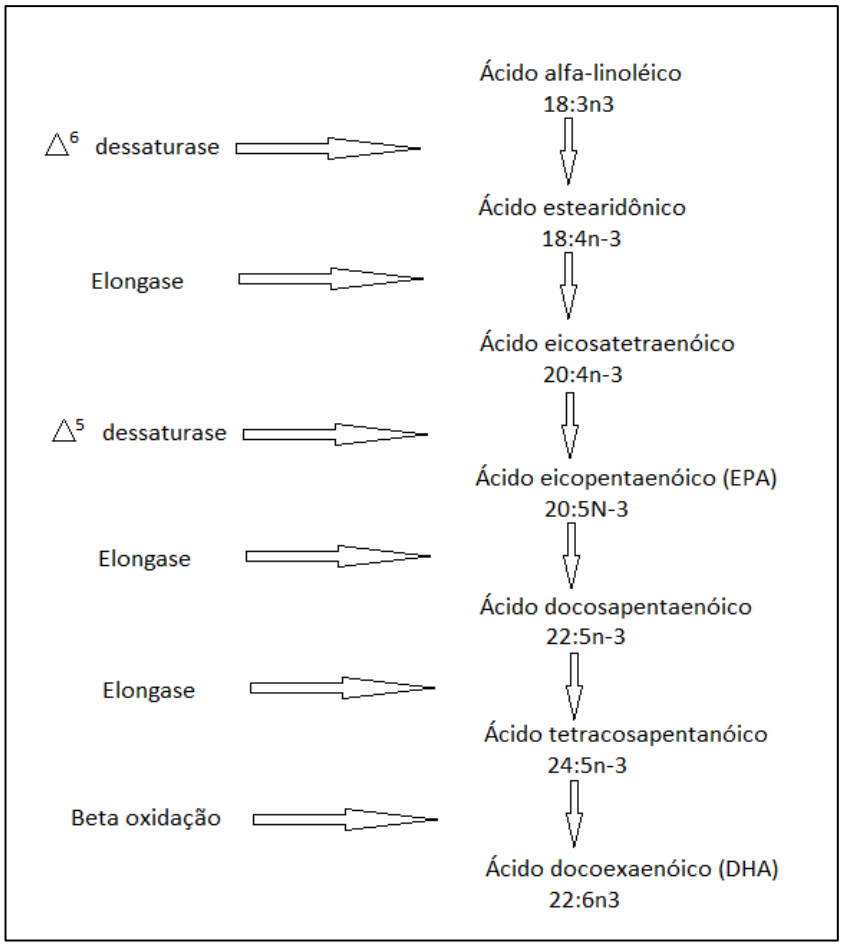

Figure 2. Metabolism of omega 3
Source: Universidade Fernando Pessoa, 2013.

DHA, has a large role in the development of the brain and retina, and are present in cell membranes. EPA and AA give rise to eicosanoids, which are inflammatory mediators. The EPA interferes with the production of prostaglandin (PG) series 3, a hormone-like substance that regulates and protects the body from effects such as platelet aggregation (due to its antithrombotic action), inflammation, and decreased immune response. [12]

As with the excess in PUFA-n6 consumption, the exaggeration of PUFA-n3 intake also causes health damage by making it impossible to generate inflammatory agents, leading to an excessive reduction in the immune response. The AGPI-n3 overdosage can accentuate the oxidative process, stimulating the production of free radicals (RL), peroxides, hydroperoxides, among others. Generally the consumption of Vitamin E together with the supplementation aids the reduction of the process of lipid oxidation. [6]

The inflammatory processes caused by PE (physical exercise) have been reduced with the use of AGP-n3, several studies on this substance have shown great effectiveness in the treatment of inflammatory diseases among others, setting expectations to reduce costs and side effects.[13]

Physical Exercise, Immune System and Agpi-N3

It is known that the practice of physical exercise has positively influenced to a healthier life, and the lack of a physical activity can trigger a sedentary life, attracting different diseases. Physical exercise is divided into mild, moderate, and intense. Light and moderate physical exercise is able to positively interfere with the natural immune function and the defense of the human organism.14 On the other hand, intense activity exercises negatively interfere in the functional capacity of the defense cells, leaving the body weakened and increasing the levels of stress hormone.1 EFI is not only related to the stimulation of the immune system in the first hours post-training, with the result that the suppression during a few hours later is the moment in which the organism becomes susceptible to the attack of microorganisms.[15]

In order to obtain the highest possible yield in the practice of intense physical exercises (EFI), it is necessary to perform a rest period between the loads. Excessively intense training combined with scarce recovery periods reduces the potential benefits of physical activity and increases the chances of muscle damage. The overload is identified when the exhaustion in intense exercises triggers a tolerance, as it will depend on the increase of strength and muscular resistance induced. [6-16]

EFI causes muscle damage and subsequent inflammation, which is indicated by muscle pain and swelling, prolonged loss of muscle function and leakage of muscle proteins.[17]

The so-called oxidative stress, is also an EFI product, caused by the instability between the formation of oxidizing compounds, (oxygen, nitrogen) and the activities of the antioxidant defense system. It is emphasized that the generation of free radicals (RL) or reactive species are the result of oxygen metabolism.[18-19]

Modifications in the immune system are followed by general and local changes that cause inflammatory pathologies. In addition to the inflammatory state generated by the exercise, changes in immune functions are accompanied by systemic alterations that are: hyperthermia, asthenia, predisposition to infections, fatigue and tissue alterations, leading to a decrease in sports performance.20 Studies show that physical exercises of high intensity, are directly associated with muscle damage and high RL production, the latter being one of the factors that can cause cardiovascular damage.[5]

PUFA-n3 are considered immunomodulators of the immune system, as they influence the functions of inflammatory cells and the inflammatory processes of the human body, modulating the receptor activities and the transport of metabolites inside and outside the cells.[7]

The anti-inflammatory process of AGP-3 is given by the decrease of AA in the membranes, resulting in the synthesis of eicosanoids derived from the decrease of AGPI-n6, where AGPI-n3 is incorporated into the cell membrane, replacing AA with EPA or DHA. EPA is the preferred substrate. Among the suppressive effects of AGPI-n3, we have the retardation of lymphocyte production, and the production of cytokines and antibodies.[1]

Thus, it is determined the increased incidence of infections and inflammations in EFI practitioners, involves a variety of physical, psychological or nutritional stressors.[21] Supplementation of AGPI-n3 has positive anti-inflammatory effects on EFS, decreasing the inflammatory process in the injured muscle by decreasing the synthesis of chemical mediators, providing a shorter recovery time and better response to high-intensity exercises.[22]

The Role of the Pharmacist in Food Supplementation

Dietary supplementation is currently being highlighted due to increased demand among physical activity practitioners to improve physical performance, according to energy and nutritional needs. However, incorrect use of supplementation can bring side effects and toxicological.[23]

According to the Code of Ethics of the Pharmaceutical Profession (Resolution nº 417, of September 29, 2004), "the pharmacist is a health professional, fulfilling all the activities inherent to the professional pharmaceutical scope in order to contribute to the safeguarding of the public health, as well as all community-directed education actions in health promotion. The pharmacist should adopt a scientific attitude towards alternative therapeutic practices so that the user is well informed and can better decide about his health and well-being "

In this context, it is necessary the presence of the pharmacist, since it can guide the appropriate use of the supplementation, guide the pharmacological effects, side effects and doping control.[24]

In February 2019, Resolution 661 of October 25, 2018 of the Federal Council of Pharmacy was regulated, which provides for pharmaceutical care related to food supplements and other categories of food in the community pharmacy, pharmaceutical office, and commercial establishments of foods.

Results and Discussion

Of the 35 articles found through searches in a specific database, those that fit the requirements framework were identified according to the purpose of this review.

Chart 1- An analysis of articles published in journals, on the subject supplementation of AGPI-n3 in patients of EFI.

References	Journal	Physical test performed	Assessed group (number and gender)	Quantity and time of supplementation	Main findings
FETT et al. (2002)	*Fitness Perfomance Journal*	Power training	12 men (7 supplemented with w-3, and 5 with TCM))	4000mg / day of AGPI-n3 and 4000mg / day of TCM for 8 weeks	The cumulative effects of training and supplementation can not be completely separated due to lack of control group.

MICKLEBOROUG et al. (2003)	*American Journal Of Respiratory and Critical Care Medicine*	Triathlon, cross country racing and track racing	20 men (10 supplements and 10 placebos)	5400mg / day for 3 weeks	It presented protective effect when suppressing inflammatory markers in athletes with IBD.
FETT et al. (2004)	*Revista Brasileira de Medicina e Esporte*	Training of force and Exhaust test	12 men (7 supplemented with w-3, and 5 with TCM)	4000mg / day of AGPI-n3 and 4000mg / day of TCM for 8 weeks	Did not change the indicators of exhaustion.
ANDRADE et al. (2006)	*Revista Brasileira de Medicina e Esporte*	Swimming	14 Men (6 supplements and 8 placebos)	1800mg / day for 45 days	Changed lipid metabolism rates, reduced plasma lipoproteins and prevented heart disease
BUCKLEY et al. (2009)	*Journal of Science and Medicine in Sport*	Football	25 men (12 supplemented and 13 placebos)	6000mg / day for 5 weeks	It improved cardiovascular functions and reduced risk factors, but did not influence resistance and recovery
NIEMAN et al. (2009)	*International Journal of Sport Nutrition and Exercise Metabolism*	Cycling	23 men (11 supplemented and 12 placebos)	2400mg / day for 6 weeks	It increased the amount of EPA and DHA in blood but had no effect on exercise performance or in combating inflammatory descriptors and immunity.
PEOPLES et al. (2008)	*Journal of Cardiovascular Pharmacology*	Submaximal Bicycle Exercises	16 men (7 supplemented and 9 placebos)	3200mg / day for 8 weeks	It acted on the skeletal cardiac muscle reducing heart rate, as well as the demand of O2 of the whole body and the myocardium without altering the performance of the athlete.

SANTOS et al. (2010)	*Biology of Sport*	Intense physical exercise, caloric restriction, restricted rest and psychological stress	20 men (10 supplements and 10 placebos)	1000mg / day for 4 weeks	It performed a protective function against the inflammatory process induced by regime of intense physical training and food restriction.
TATIBIAN, MALEKI e ABBASI (2010)	*Journal of Science and Medicine in Sport*	Wrestling	40 men (10 supplemented, active control - 10 supplemented, inactive control - 10 supplemented, experimental and 10 placebos)	1000mg / day for 12 weeks	It improved the lung function of athletes during and after exercise.
ATASHK et al. (2013)	*Kinesiology*	Treadmill Exhaust Test	20 men (10 supplements and 10 placebos)	3000mg / day for 7 days	It prevented the increase of the systemic inflammation produced by exercises of intense resistance

Final Considerations

Regarding the main results of the reviewed articles, it has been that the supplementation with PUFA-n3, altered the lipid metabolism indexes, improved the pulmonary function of athletes during and after exercise, suppressed inflammatory markers in resistance exercises, played a protective role against the inflammatory process induced by intense physical training regimen.

The aim of the present review was reached, the study of this substance and its effects may bring new horizons in the treatment of inflammatory diseases, however there is controversy on the subject in some articles, since there is still a need for some future scientific studies.

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