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Research Article

Lipid Use in the Exercise: A Literature Review

Janilson Avelino da Silva*

Universidade Federal da Paraíba, Brazil

***Corresponding author:** Janilson Avelino da Silva, Universidade Federal da Paraíba, Brazil

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Abstract

Lipids are relevant energy sources used without prolonged exercise. In addition, small increases in the ability to use lipids, as an energetic substrate resulting from training capable of an effecting use of carbohydrates. The present literature review aimed to analyze the importance of the use of lipids in the practice of physical exercise. In the months of April and June of 2016 the search of the publications in the databases was carried out: Latin American and Caribbean Literature in Sciences of the Health and in Electronic Library Scientific Library Online (SciELO), published in the languages, English and Spanish, which discuss the use of lipids in physical activity. We excluded studies that did not address the theme There were 159 articles. In the LILACS database, only three articles were selected that are linked to the Nutrition area. In the SCIELO database. The predominant use of fatty acids as an energy source is perceived. In this way, the importance of the lipids to the energy supply during the physical exercise is verified.

Keywords: Lipids; Physical Activity; Sport

Introduction

Lipids are substances insoluble in water, represented mainly by triaglycerols, phospholipids and cholesterol. Triaglycerols represent the most abundant form of lipids found in food, as well as in the human body. In relation to phospholipids, they represent the main structural element of cell membranes, while cholesterol is a precursor of hormones and a constituent of bile. When they are solid at room temperature, they are called fats, and when they are in liquid form, they are called oils. Fats and oils can be easily seen in some foods, such as meat, or not as visible, as in milk and creams, where they are in suspension [1]. Food contains several types of lipids, but quantitatively Triaglycerols (TG) represent the most relevant. At the same time, TG are the body's main energy reserve, making up, on average, 20% of body mass, which is equivalent to a mass 100 times greater than that of hepatic glycogen. Nevertheless, lipids are relevant sources of energy used in prolonged exercise. In addition, small increases in the ability to use lipids as an energy substrate resulting from training can effectively save the use of carbohydrates. Rogero, César, Tirapegui, 2013]. Fat intake should vary from 20% to 35% of total energy consumption, which corresponds to approximately 1g of lipid per kilogram of body weight per day. Consuming less than 20% of energy from fat does not benefit performance, since fat, which is an energy source, a vehicle for fat-soluble vitamins and essential fatty acids, is essential in the diet of athletes [2].

The 2005 Dietary Guidelines, as well as the Canadian Food Guide, recommend that the energy proportion of the total energy value supplied from fatty acids be 10% composed of saturated, 10% polyunsaturated and 10% monounsaturated, as well as inclusion of sources of essential fatty acids, which should vary between 8 to 10g per day. Athletes should follow these general recommendations [2]. A detailed assessment of the athlete's body composition can be advantageous for those who plan actions in search of improving athletic performance. Age, gender, genetics and the demands of sport are factors that influence the body composition of an individual athlete, and the ideal body fat levels depend on these factors. Therefore, the reference values must be specific for each sport [2]. Thus, it aimed to analyze the importance of using lipids in the practice of physical exercise. The present research uses the integrative literature review method, which aims to gather and summarize the scientific knowledge already produced on the investigated topic, that is, it allows searching, evaluating and synthesizing the available evidence to contribute to the development of knowledge in thematic.

Methodology

For the construction of this integrative review, the following steps were performed: definition of the specific subject (problematic) and research objectives; literature search; analysis and categorization of studies, presentation and discussion of results. The review was conducted based on books and scientific articles dealing with the theme. For the search for articles, we searched, during 2016, publications indexed in the following databases: Latin American and Caribbean Literature in Health Sciences (LILACS) and in the electronic library Scientific Electronic Library Online (SciELO). Lipid, physical activity and sport were used for the search separately and in an integrated manner. Also included were full articles available in full; published in Portuguese, English and Spanish; in the period between 2010 and 2016. Studies that did not address the research topic were excluded. The analysis of the selected material took as criteria the categorization of studies according to the type of study and objectives, place of research, year of publication, methodologies used, and main results found. The studies were brought together to better present the results.

Results and Discussions

a) 159 articles were found, 139 of which were related to the keyword's lipids and physical activity (87%) and 20 were related to lipids and sport, which represents 13% of the articles found.

b) In the LILACS database, from the 139 articles found, only 3 articles were selected that were linked to the Nutrition area, representing 3% of the scope found.

c) In the SCIELO database, 20 articles were found with the mentioned descriptors, with 2 articles being selected, representing 7% of the articles found.

d) The breakdown of the frequency of articles by the descriptors used can be seen in the table below (Table 1).

Table 1: Details of the frequency of articles.

Data base	Keywords	Frequency
LILACS	Lipids and physical activity	20
Scielo	Lipids and sport	139
Total		159

Lipids are sources of energy, vitamins and essential fatty acids, and their importance in the diet of healthy active individuals is of interest, since the chemical structure of lipids can favor inflammation or anti-inflammatory actions [3]. According to Lima-Silva et al. [4], with the beginning of the exercise, there is an increase in the release of adrenaline and noradrenaline, which will bind to the β3 receptors of the adipocyte membranes, triggering a classic cascade reaction. Other hormones, such as Growth Hormone (GH), Stimulating Thyroid (TSH) and Adrenocorticotropin (ACTH), also appear to activate cascade reactions. However, catecholamines (adrenaline and norepinephrine) are the main activators. Glycerol is released and transported freely by the blood to the liver, where it can be used in gluconeogenesis or serve as an intermediate for glycolysis, in the form of Glyceraldehyde-3-Phosphate. Once disconnected from fatty acids, both in adipose and muscle tissue, glycerol will necessarily go into the bloodstream, and cannot be used directly for the resynthesize of new TGs, due to the absence of the glycerol kinase enzyme in these tissues. Fatty acids bind to albumin (AGL) because they are fat soluble and cannot be transported free in the plasma, being subsequently taken to the skeletal muscle to be used as an energy source Lima-Silva et al. [4].

Dâmaso and Nascimento [5], point out that many trained individuals use predominantly fatty acids as an energy source compared to carbohydrates during exercise, compared to sedentary individuals. These metabolic adaptations resulting from training can interfere with plasma glucose homeostasis by mobilizing fat supply. More recent theories, in the muscle fiber membrane there is a protein that "receives" fatty acids, called protein for binding with fatty acids in the plasma membrane (Plasma Membrane Fatty Acid Binding Protein-FABPPM) [4]. Other proteins appear to be involved in the transport of FFA through the membrane, called Translocase Fatty Acid (Fatty Acid Translocase-FAT) and Fatty Acid Transport Protein (Fatty Acid Transport Protein-FATP) [4].

According to Lima-Silva et al. [4], once the membrane is transposed, the fatty acids bind to a protein, called a protein to bind to the fatty acids in the cytoplasm (cytoplasmic fatty acid binding protein-FABPC) that will transport them through the cell cytoplasm until they reach the outer membrane of the mitochondria. The transport of fatty acids appears to be selective with regard to the size of the molecule. Fatty acids, still in the cytoplasm, are converted to acyl-CoA by the action of the enzyme Acyl-CoA Synthetase, present in the outer membrane of the mitochondria. This reaction is essential, since the mitochondrial membrane is extremely selective. Fat metabolism as a function of effort intensity has a quadratic behavior, with the greatest use of this substrate occurring close to 60-65% VO_2 max [4].

For Lima-Silva et al. [4] with Romijn JÁ et al. 1993, p.110 at high intensities, such as 85% of VO2 max, there is a significant decrease in the use of fat as an energy source, partially due to the lower concentration of plasma AGL current. Dâmaso and Nascimento [5] (1998, apud OLLER et al., 1986, p. 59) suggest that the percentage of uptake of dietary lipids by tissues is also dependent on the period (age of the animal), physiological event and studied tissue, in addition to being known to be related to the activity of Lipoprotein Lipase-LPL (enzyme located in the capillary endothelium), responsible for the capture of lipids. According to Lima-Silva et al. [4] (2006, apud GREEN HJ et al., 1979, p. 110) the most likely hypothesis that would explain the marked decrease in plasma AGL concentrations in intense exercises, even with higher levels of circulating adrenaline and norepinephrine, would be a possible re-esterification of TGs in adipose tissue. Still according to the author, another possible explanation for the lower release of FFA in intense exercises would be a possible decrease in blood flow in the adipose tissue, causing a smaller amount of free albumin to reach the site. Since FFA cannot be transported freely in plasma, they would be re-esterified LIMA-SILVA et al. [4] (2006, apud HAWLEY JA et al., 2002, p. 110).

For the author, evidence obtained indirectly has supported a greater use of intramuscular TGs in exercise lasting two hours, performed after five days of a high-fat diet LIMA-SILVA et al. [4] (2006, apud HAWLEY JA et al., 2002, p. 110). Valle et al. [6] argue that the exacerbated increase in the rate of lipolysis results in high plasma concentrations of non-esterified fatty acids, contributing to the increase in hepatic synthesis of VLDL, in addition to inhibiting the glucose uptake stimulated by insulin, in a dose dependent manner, resulting in peripheral insulin resistance. The sedentary lifestyle is a clearly identified behavior with an unfavorable lipid profile [6]. Still according to Valle et al. [6] (2009, KELLEY et al, 2005, p. 5) the explanation for such changes probably lies in the promotion of better functioning of the enzymatic processes involved in lipid metabolism. The increase in the enzymatic activity of lipoprotein lipase is the finding best supported by evidence, which can occur from a single session of physical exercise, as well as during training. Reducing the lipid content of the diet, with a consequent increase in the proportion of carbohydrates, could therefore prevent and treat obesity. However, there is still much controversy. Although certain individuals, under medical or nutritional supervision, may benefit from very low-fat diets for weight loss, the American Heart Association does not recommend them for the general population for several reasons. First, because some research indicates that weight loss would not be sustained for long. In addition, they can lead to the ingestion of essential fatty acids below the recommended and are often associated with the use of processed foods with reduced fat content, but with high energy density, due to the greatly increased content of simple carbohydrates. Finally, this type of diet could aggravate abnormalities, such as low HDL levels, hypertriglyceridemia and hyperinsulinemia.

Conclusion

The importance of lipids in terms of energy supply is verified during physical exercise, especially with regard to trained individuals who use predominantly fatty acids as an energy source in relation to carbohydrates during exercise, compared to sedentary individuals. During fat metabolism close to 60-65% VO_2 max due to intensity and effort, there is a greater use of this substrate, when compared to high intensities, such as 85% VO_2 max, where there was a significant decrease in the use of fat as a source of due to the lower concentration of circulating plasma FFA. Thus, it is believed that another possible explanation for the lower release of FFA in intense exercise would be a possible decrease in blood flow in adipose tissue. Thus, it is observed the importance of adopting a healthy lifestyle, through a dietary intervention and inclusion of physical exercises.

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