



**BARÇA
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Certificate in Sports Nutrition

1.1 Classification of Nutritional Supplements

1.1.1 Useful Terms (pH, Absorption Mechanisms, Km from Receptors, Half-Life)

Supplement

The Oxford English Dictionary definition for supplement is: "Something that is added to make up for a deficiency" (Burke, Castell & Stear, 2009, p. 728).

In the FCB, supplements are commonly used among athletes and coaches to improve performance, for faster recovery and to improve overall health. It is important to note that supplements are rarely needed if the athlete's diet is healthy, varied and balanced.

There are exceptions where supplements can help performance or recovery, but in any case they would have to be consumed to supplement a healthy and balanced diet, never as a substitute. Thus, by definition, nutritional supplements should be used to supplement the diet, not to replace it (Jeukendrup & Gleeson, 2010).

The most important factor, if choosing to supplement, is that the chosen approach must comply with the code of conduct of the World Anti-Doping Agency (WADA). Specifically, it should ensure that all the supplements are free of banned substances.

Sports Foods

Sports foods are made up of the same nutrients as food, essentially carbohydrates, proteins and lipids. However, their portability, presentation and composition make them very practical for use at specific times in different sports, in order to improve performance and promote recovery.

Ergogenic Aids

According to the **International Society of Sports Nutrition (ISSN)**, an ergogenic aid is "any training technique, mechanical device, nutritional practice, pharmacological method, or psychological technique that can improve exercise performance capacity and/or enhance training adaptations" (Kreider et al., 2004, p. 2).

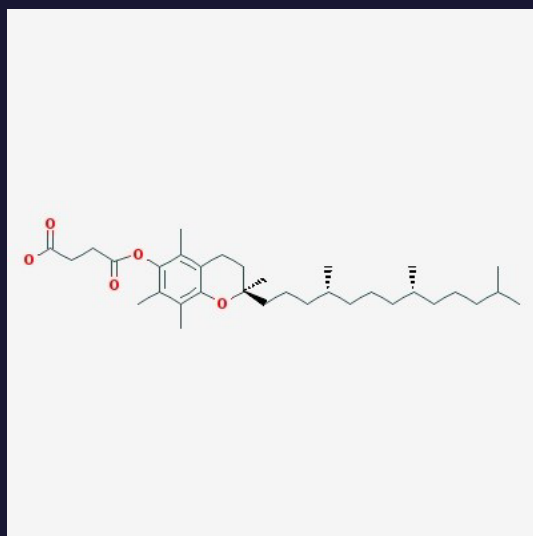
One can see that the definition is quite broad and covers many aspects. In the following course we will focus specifically on nutritional practices having to do with supplementation, which will not only allow for an increase in acute and chronic performance, but also increase tolerance to training, which in the long term may result in chronic performance improvement. Probably the most important aspect is that this improvement is achieved respecting the integrity of the immune system and supporting an improved level of recovery, which translates into better overall health for athletes of different levels, and thus a significant decrease in injuries and fatigue.

Chemical Structure

The branch of chemistry that studies carbon compounds (carbon chains with different functional groups) is called **organic chemistry** (Wade, 1993) and it is through this field that most ergogenic aids, chemical compounds and nutrients to be reviewed in these modules, may be analyzed.

The chemical structure of a molecule is composed of the atoms that form it, as well as their distribution in space. In organic chemistry, there are always carbon chains that consist of a different number of carbon atoms linked together and connected in turn to different atoms or functional groups such as acids, aldehydes and amino, among others. An example of a complex chemical structure of a molecule (or macromolecule in this case) is a protein, in which its primary structure indicates the amino acid sequence that shapes it. The secondary structure of a protein involves the folding of the chain of amino acids and its tertiary structure involves the arrangement in space of the whole molecule. Figure 1 shows the chemical structure of vitamin E (micronutrient).

Figure 1: Chemical Structure of Vitamin E



Source: Adapted from National Institutes of Health, 2005.
Retrieved from <https://goo.gl/yMxE6d>

Functional groups

The reactive part of a molecule is called the **functional group**, because that is usually where the reactions take place (Wade, 1993). Among the functional groups of organic molecules that are of interest to the topics to be reviewed, one may consider, among others, the following:

- Alcohols: they are organic compounds that have the functional group hydroxyl (—OH).
- Ethers: they are formed by two radicals (R) linked to an oxygen atom (R—O—R').
- Aldehydes and ketones: the functional group is a carbonyl group (C=O).
- Carboxylic acids: contain the carboxyl group (—COOH).
- Esters: are formed from the reaction of a carboxylic acid with an alcohol (R—CO—O—R').
- Amides: are formed from the reaction of a carboxylic acid with an amino group (—NH_2). Significantly, this type of chemical bond is what unites the different amino acids in a peptide or protein.