



Review

Nutraceuticals for older people: Facts, fictions and gaps in knowledge

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ABSTRACT

In the last decades nutraceuticals have entered the health market as an easy and attractive means of preventing diseases. These products are of interest for an increasingly health-concerned society and may be especially relevant for preventing or delaying a number of age-related diseases, i.e. arthritis, cancer, metabolic and cardiovascular diseases, osteoporosis, cataracts, brain disorders, etc. Nutraceuticals are marketed in a variety of forms, composition and potential applications which have made their definition ambiguous and their use uncontrolled and poorly funded. Although epidemiological, animal and in vitro studies have given evidence of the potential benefits of some of these nutraceuticals or of their components, definitive proof of their effects in appropriate human clinical trials is still lacking in most cases, more critically among people above 65 years of age. We cover the well-established nutraceuticals (polyvitamins, omega-3 fatty acids, etc.) and will focus on many other 'novel' commercial nutraceuticals where the scientific evidence is more limited (food extracts, polyphenols, carotenoids, etc.). Solid scientific evidence has been reported only for a few nutraceuticals, which have some health claims approved by the European Food Safety Authority (EFSA). Further well-designed trials are needed to improve the current knowledge on the health benefits of nutraceuticals in the elderly. Overall, there are some facts, a lot of fiction and many gaps in the knowledge of nutraceutical benefits.

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1. Introduction

Aging is a continuous process that commences in the fetus and advances throughout our entire life. Oxidative stress, systemic low-grade chronic inflammation and the impairment of hormonal, fibrinolytic and immunological status are major risk factors underlying aging and age-related diseases such as osteoarthritis, cancer, type 2 diabetes, Alzheimer, cognitive decline, obesity, osteoporosis, metabolic syndrome, cardiovascular (CVD) and cerebrovascular diseases, and others [1]. Human life expectancy is continuously growing and by 2025, 10.4%, 18.8% and 21% of the World, USA and European populations, respectively, will be represented by persons aged 65 years and older [2]. This is major point of concern for public health, since older ages are associated with an increase of the above mentioned chronic-degenerative disorders and increasing need for medical attention and social support with significant effects on social, economic and clinical burdens [3].

Although there may be an important genetic component at the onset of these pathologies, life styles (diet, smoking, sedentary habits, etc.) are critical determinants of a healthy aging. In this regard, preventive actions such as adherence to the Mediterranean diet or the regular practice of exercise can delay the onset of age-related diseases [4]. In addition, a number of dietary supplements, medical foods, nutraceuticals, food complements, and functional foods have invaded the food and health market with the aim of contributing to health maintenance and disease prevention. The intake of these products varies with the country, the age or the sex of the population. For example, consumption of these supplements and foods is higher in the USA (around 40% of adult population) [5] and in the North of Europe [6] than in other areas. In a Spanish population of 6352 individuals (males and females) ranging from 35 to 80 years, 9% were consumers of dietary supplements (mainly vitamins and minerals). Among consumers, 72% were women, preferentially in the range from 35 to 49 years, and with higher educational level and adherence to the Mediterranean diet pattern than non-consumers [7]. The intake of these type of products, and in particular of nutraceuticals, may be of special relevance for the elderly population.

In the present review we discuss the need for a better definition of the widely used term 'nutraceutical'. This is not a systematic review but an overview and update of the scientific evidence behind the intake of nutraceuticals in the elderly for different age-related pathologies or disorders. We cover well-established nutraceuticals (polyvitamins, minerals, etc.) as well as other 'novel' nutraceuticals already commercially available and for which the scientific evidence is very limited. Bibliographical retrieval has considered only older people (≥ 65 years), except in some specific cases, when

only few studies are available and the cut-off age was around 60 years.

2. Nutraceutical: a concept looking for a universal definition

A compendium of definitions is currently used for the term 'nutraceutical'. The meaning of this word varies depending on the country, institution/organization, commercial companies and consumers. Overall, there is no universally accepted definition for this term since 'dietary supplements' are often confused with, or used as synonyms with 'nutraceuticals' and/or 'functional foods' and/or 'medical foods', etc. In addition, nutraceutical is also commonly used to denote approaches or properties, i.e. 'nutraceutical applications', 'nutraceutical techniques', 'nutraceutical value', 'nutraceutical effect', 'nutraceutical intervention', 'nutraceutical strategy', etc. Therefore, sometimes it is not clear whether nutraceutical is a type of product or the property of something.

The *European Nutraceutical Association* (www.enaonline.org) defines nutraceutical as 'nutritional products which have effects that are relevant to health. In contrast to pharmaceuticals however, these are not synthetic substances or chemical compounds formulated for specific indications. These are products that contain nutrients (partly in concentrated form) and are assigned to the category of food'. Therefore, this definition does not include dietary non-nutrient compounds such as polyphenols (isoflavones, resveratrol, etc.), or some carotenoids (lycopene, lutein), etc., which are commonly marketed as nutraceuticals.

The *American Nutraceutical Association* (<http://www.anajana.org>) uses the definition coined by De Felice [8]: 'A nutraceutical is any substance that is a food or a part of a food and provides medical or health benefits, including the prevention and treatment of disease. Such products may range from isolated nutrients, dietary supplements and specific diets, to genetically engineered designer foods, herbal products, and processed foods such as cereals, soups and beverages'. This definition also includes dietary non-nutrient compounds. However, the direct allusion to food (cereals, soups and beverages) means that the boundary between the current concepts of 'functional food' and 'nutraceutical' is not well established in this definition.

The definition coined by DeFelice was further modified by Health Canada (www.hc-sc.gc.ca): 'Nutraceutical is a product isolated or purified from foods, and generally sold in medicinal forms not usually associated with food and demonstrated to have a physiological benefit or provide protection against chronic disease'. In this definition, a clear difference between a food and a nutraceutical is established. However, this definition does not include that dosages should exceed those obtained in a normal, balanced diet.

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