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Anti-Aging Medicine Includes Hypotheses of Aging Process of Oxidation, Intestinal Flora and Glycation

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Abstract

Anti-aging medicine has been important with adequate lifestyle and prevention of diabetes and cardiovascular diseases. Some hypotheses of aging process have been accepted as three axes in the following: i) oxidation: reactive oxygen species (ROS) are molecules capable of independent existence, including oxygen free radicals, ii) intestinal flora: healthy microbiota bring benefit for immunity, cancer, sarcopenia, inflammation, cardiovascular and oxidative stress, iii) glycation: advanced glycation end product (AGE) may be important causes for aging process. AGE lead to metabolic abnormalities, then low carbohydrate diet (LCD) would be beneficial. This article will be hopefully a reference for future research development.

Keywords: Anti-aging medicine; Oxidation; Reactive oxygen species (ROS); Advanced glycation end product (AGE); Low carbohydrate diet (LCD)

Introduction

Recently, the crucial problems concerning COVID-19 has been continued across the world. Usual daily life related to anti-aging medicine seems to be considered [1]. Among them, anti-aging measures have been important especially for prevention of diabetes and cardiovascular diseases [2]. In the progressively aging population, the ultimate goal would be conducting primary and secondly prevention of diseases and reducing socioeconomic impact of age-related impairments. It is necessary to raise some adequate markers which can identify the person with possibly risky situation of vascular damage [3]. In this article, some meaningful information would be described concerning anti-aging medicine, factors of biological aging, cardiovascular influence and adequate diet with carbohydrate.

Hypotheses of anti-aging

For long years, there have been some well-known questions about anti-aging medicine. Why do people get old? Can we get any drugs with dramatic effects on aging? Is there an immortal medicine? There are no apparent ideal answers to these. As a reference, meaningful comment was present from a prominent physician, Sir William Osler (1849-1919) [4]. He left the phrase that “A man is as old as his arteries”. The human body is finite, and all organs are declined with age. For its fundamental phenomenon, blood vessels may become older as arteriosclerosis associated with age, and some risk factors may accelerate aging process of blood vessels. Traditionally, some hypotheses for aging process have been accepted. They are three axes, which are oxidation, intestinal flora, and glycation. These outlines and some topics were described in the following.

The first is the oxidation

Humans always produce and consume energy by using oxygen. Among them, some of them may become "superoxide" which is difficult to prevent [5]. Human cells obtain several useful systems which can remove harmful superoxide. However, if superoxide may be present beyond the capacity, the cell will be influenced to dysfunction or cell death. An oxidative theory means that this accumulation would be the basic mechanism for aging process.

For adequate measures, to take certain particular molecule is possible that can clear superoxide. Reactive oxygen species (ROS) are molecules capable of independent existence, including oxygen free radicals [6]. Production of free radicals is increased by long-term stress conditions, improper diet, intense physical exercise, use of stimulants and excessive exposure to ultra-violet radiation. ROS may bring chemical modifications and also damages to carbohydrates, proteins, lipids and nucleotides. Thus, oxidative stress causes a special adverse effect on cardiovascular, respiratory and nervous systems [7].

The second is the intestinal flora

Intestinal bacterial flora has been recently investigated and reported for anti-aging region [8,9]. Generally, they are roughly divided into beneficial and non-beneficial bacteria. Aging seems to be related with the accumulation of several toxins from intestinal bacteria. Human healthy aging can be obtained by reducing the risk factors which may cause various damage and pathologies with aging. These factors can been modified through adequate nutrition and intestinal microbiota [10]. Healthy microbiota will bring benefit for immunity, cancer, sarcopenia, inflammation, cardiovascular, oxidative stress, neurodegenerative diseases. They include fibers, fats and polyphenols, such as Mediterranean diet and oriental diet [11]. Regarding the therapeutic method, intake of some probiotics such as yogurt for increasing beneficial bacteria and reducing non-beneficial bacteria and others [12].

The third is the glycation

It means a phenomenon that human cells have various damage and deterioration due to the influences of excess carbohydrates taken by meals [13]. Glycation is the biochemical condition that advanced glycation end product (AGE) produced by the combination of protein and carbohydrate would act on tissues and/or cells in the body, and that this may be one of the important causes for aging process [14].

AGEs have been in focus for impaired function of metabolism. AGEs are heterogeneous group of molecules from the interaction of reducing sugars and amino acids, proteins, nucleic acids and lipids [15]. They are made from normal metabolic consequences and are also absorbed from the meal. Elevated AGE values may influence metabolic health and bring to metabolic abnormalities such as diabetes. Due to hyperglycaemia, AGE levels are increased, and AGEs will stimulate signalling pathways with compromising pancreatic beta-cell function. Furthermore, AGEs may exacerbate the obesogenic influence from Westernized meal by increasing hypothalamic inflammation and disrupting the control of energy balance [15].

AGEs are organic molecules which are formed in all living organisms associated with various structural and functional properties. As they show a variety of heterogeneity, no specific examination for the operational detecting measurements [16]. However, there have been several trials for AGE present in biological samples using serological, chromatographic, spectroscopic and colorimetric methods. For the therapy and protection of glycation, it would be beneficial to make limitation of in taking carbohydrates in the daily life [17]. As to nutritional therapy for carbohydrate amount, lots of discussions were found concerning calorie restriction (CR) and low carbohydrate diet (LCD). LCD was begun in Europe and North American by Atkins et al. [18]. After that, various controversies were continued [19], and Bernstein and et al. have summarized the standard concept and treatment for LCD [20].

Authors and collaborators have continued clinical practice and research concerning LCD for long. We investigated glucose variability in patients with type 2 diabetes mellitus (T2DM) and research on ketone bodies (KB), M value and continuous glucose monitoring (CGM) and others [21]. We also reported the clinical significance of elevated KB for mother-new-born-placenta-fetus axis [22]. Further, practical LCD methods were proposed for medical and health care region. They are petite-LCD, standard-LCD and super-LCD, which contains carbohydrate ratio as 40%, 26%, and 12%, respectively [23]. The ketogenic diet from LCD has been effective for various patients with T2DM, obese and sarcopenia [24].

In summary, some topics concerning anti-aging, oxidation, intestinal flora, glycation, LCD and cardiovascular diseases were introduced [2]. The important points include that i) cardiovascular aging and longevity may have common pathophysiological characteristics, ii) delaying cardiovascular aging may improve longevity and iii) recommended regimen include LCD, Mediterranean diet, CR, physical activity, associated with favourable genetic and environmental background. This article will become hopefully a reference for future development of anti-aging medicine.

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