


**Editorial**
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## Anti-Aging Medicine Has Axes to Be Explored in Oxidation, Intestinal Flora and Glycation

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**Editorial**

In recent years, anti-aging medicine has been gradually spreading worldwide [1]. In the medical community, the American Academy of Anti-Aging Medicine (A4M) and the Japanese Society of Anti-aging Medicine (JSAM) have played important role in both countries [2,3]. Furthermore, other related academies or societies in lots of countries have been developing anti-aging medicine in the light of medical practice, research and education.

One of the educational institutes would be Metabolic Medical Institute (MMI) in A4M. It provides continuing medical education (CME) and training to more than 65,000 physicians and healthcare practitioners at global A4M conferences and events [4]. Furthermore, it also gives online CME education focused on functional, metabolic, and regenerative medical sciences, which should be learned especially in such trend and situation.

By the way, there has been a well-known proposition in anti-aging medicine for long. It is “Why do people grow old?” and “Is there countermeasure or medicine for the elderly?” Humans have been thinking about this subject for thousands of years. However, clear answers have not been obtained yet.

As the possible speculation, various hypotheses have been reported so far. Under these circumstances, following 3 hypotheses seem to be rather accepted as the aging theory. They are 3 axes of 1) oxidation, 2) intestinal flora and 3) glycation. These topics are introduced and explained in this article.

1) Oxidation: Humans always produce energy by using oxygen, while some of them are always becoming “superoxide” which is difficult to prevent [5]. Human cells have several systems that can remove harmful superoxide. However, if superoxide is present beyond its capacity, the cell becomes to dysfunction or cell death. An oxidative theory is to consider that this accumulation is the fundamental mechanism of “aging”. As measures and treatments, taking certain particular molecule that can clear superoxide.

2) Intestinal flora: Recently, the intestinal bacterial flora has been studied in the field of anti-aging [6,7]. In general, it is roughly divided into good and bad bacteria. Aging is considered to be involved in the accumulation of toxins from intestinal bacteria. As measures and treatments, taking some probiotics are found such as yogurt for increasing good bacteria and reducing bad bacteria and others [8].

3) Glycation: It is a phenomenon that human cells has damage and deteriorate due to excess carbohydrates taken by meals [9]. Glycation means that advanced glycation end products (AGEs) produced by the combination of carbohydrate/protein acts on tissues/cells in the body, and that this seems to be the cause of aging [10]. As a treatment, it is effective to limit the intake of carbohydrates [11].

When considering above three axes and theories, we can pay attention to the measures and treatments. For oxidation and intestinal flora, special food intake or special strategy are required. On the other

hand, for glycation, it is only to reduce the intake of carbohydrates, and it is not necessary to develop a special procedure.

For superoxide, this is produced mostly when carbohydrates are metabolized. In addition, for intestinal flora, the most crucial matter to grow bad intestinal bacteria is sugar. From the above, larger effects would be expected by the strategies against glycation.

How can we respond to these three points? For oxidation, several factors are related to our daily life, such as temperature, humidity, light exposure, air, water and so on. It is important that these degree do not exceed allowable range in the living environment. Regarding intestinal flora and glycation, a variety of food and meal that we are actually taking every day has been directly influenced.

As three major nutrients, there are PFC (protein, fat, carbohydrate). Formerly, it was believed to be the standard balance that PFC ratio in daily meal was PFC=15: 25: 60 [12]. Depending on the country and region, larger differences have been present concerning this balance. Then, it is difficult to discuss an ideal ratio responsible for any countries.

Due to the development of research on anti-aging, reports on PFC have been increasing in recent years [13]. From the standpoint of anti-aging, there is an opinion that the balance of PFC is recommended to be one-third each [14]. However, it is difficult to set clear numerical values for the ratio of three major nutrients [15]. There has been a tendency to decrease the carbohydrates more than before.

As long as glucose has been taken for a major energy substrate in ordinary human meals, various risk derived from 3 factors will persist forever. We must consider that this glycation problems will be invariably occurring for long. This glycation combined with glucose and protein (AGEs) will lead to aging, and has been focused on attention for anti-aging medicine.

On the other hand, how about LCD? The ketone body system has been in operation all the time, and the problem of glycation is not recognized at all. Conventionally, discussion of calorie restriction (CR) and low carbohydrate diet (LCD) has been continued, and the latter seemed to be larger effects for obesity and diabetes. In this area, we have continued clinical research and reported various findings [16-18].

To summarize the above, important factors in the anti-aging medicine would be 1) oxidation, 2) intestinal flora and 3) glycation

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[19]. There are various relationship among these [20]. In these fields, prevention and suppression of glycation will be particularly indispensable. What we can pay attention to in our daily lives is that the reduction of carbohydrate intake will be useful theoretically and practically from now on.

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