

An Ultimate Approach to Retarding the Aging Process by Integrating Traditional Chinese Medicine and Western Medicine

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Abstract

Aging and death are unavoidable in life. While immortality may be impossible, many people dream of living a long and healthy life. Throughout history, humans have searched for ways to stay young, but have not found an effective way. This may be because the methods used do not target the causes of aging directly. To address this, we investigated how to delay aging using traditional Chinese medicine (TCM) and Western medicine approaches. In this article, we will explain the causes of aging in the context of TCM and Western medicine and suggest methods to delay it. By integrating TCM and Western medicine, I hope to help everyone age healthily and enjoy a long life.

Keywords

Aging, Traditional Chinese Medicine, Zang Xiang System, Zheng Qi, Western Medicine, Mitochondria, Mitophagy, Senolytics, Glutathione Antioxidant Response

1. Introduction

Traditional Chinese medicine (TCM) is a valuable source of medicine that has been around for thousands of years. Just like Western medicine, which uses drugs, vitamins, and dietary supplements, the Chinese have long used herbs, animal drugs, and natural minerals (known as Chinese herbal medicines) to prevent and treat diseases. Unlike Western drugs, Chinese herbal medicines not only relieve disease symptoms but also have a preventive effect on potential disease-causing factors, thereby increasing a healthy lifespan [1]. It has been suggested that human life consists of two physiological systems: the "anatomical physiological system" and the "Zang Xiang physiological system" [2]-[4]. These two systems combine to form a hidden physiological system known as the "Zang Xiang system" in TCM (see Figure 1). A two-way communication between the "Zang Xiang system" and the anatomical physiological system exists to keep the balance of function in "Zang-Fu" (visceral organs) and homeostasis in the anatomical body (Figure 1). TCM focuses on the "Zang Xiang system" rather than just the anatomical body. The theory of TCM revolves around two relationships: the "Zang Xiang system" and the "anatomy physiological system" of the body, and the "Zang Xiang system" and the "Cosmic Essence" derived from the universe that can promote its function. The latter provides the basis for how humans can interact with the universe in unity [3] [5].



Figure 1. Inter-relationship between Zang Xiang system and anatomical physiological system.

1.1. How "Zheng Qi" Is Generated?

According to ancient philosophy, Tai Chi (also called Dao) generates "Yin and Yang" between heaven and earth. The interaction of "Yin and Yang" creates "Qi" [6]. In TCM theory, the generation of "Qi" in our body is mainly regulated by the "Lung", "Spleen", "Stomach", and "Kidney". There are three sources of "Qi": 1) "Primordial Qi" inherited from parents and stored in the "Kidney"; 2) "Qing Qi" obtained from the atmosphere and 3) "Grain Qi" derived from food and water [7] [8]. "Qing Qi" and "Grain Q" are acquired after birth and provide energy for mobilizing "Primordial Qi" from the "Kidney" to interact with the "Spleen and Stomach", thereby driving the processing of "Qing Qi" and "Grain Qi" to form "Zong Qi". "Zong Qi" in turn combines with "Primordial Qi" to generate "Zheng Qi", which is known as vital energy (**Figure 2**) [9].



Figure 2. Factors affecting "Zheng Qi" generation and aging.

1.2. What Is the Function of "Zheng Qi"?

"Zheng Qi" is made up of two main components: "Ying Qi" and "Wei Qi" [9] [10]. "Ying Qi" nourishes the "Zang-Fu" organs in the body, while "Wei Qi" helps to fight off external threats. Essentially, "Zheng Qi" is the basic substance that supports life activities and maintains overall health. It does this by regulating the body's functions to adapt to the environment, balancing the internal and external forces of "Yin and Yang". Additionally, "Zheng Qi" can resist diseases and prevent them from occurring. This is more than just a defensive barrier like innate immunity. It also involves adaptive immunity in that the body's systems work together to respond to both external and internal threats. Lastly, "Zheng Qi" also has a self-healing ability, allowing the body to eliminate any harmful substances after receiving treatment for a disease [8] [11]-[13].

1.3. How Does TCM Explain Aging?

In TCM, there is a saying: "The complete deprivation of "Zheng Qi" leads to death". This means that life comes to an end when "Zheng Qi," is cut off [14]. The generation of "Zheng Qi" is influenced by both prenatal and postnatal factors [15]. According to TCM theory, the key to human aging lies not in the anatomical physiological system but in the "Zang Xiang system" of which the vitality is supported by "Zheng Qi" [3] [16] [17].

"Primordial Qi" is a type of energy that belongs to the "Yang" aspect of the body. It is provided by the "Zang Xiang System" and cannot be replenished once it is used up [18] [19]. After the age of 10, the "Primordial Qi" starts to dissipate at a steady rate [20]. It is believed that the "Primordial Qi" can sustain this dissipation at a normal rate until around the age of 120 [3] [21]. The production of "Zheng Qi" relies on the presence of "Primordial Qi". If the "Primordial Qi" dissipates too quickly, it can lead to insufficient production of "Zheng Qi" and

cause the aging of the body's "Zang Xiang system" and the anatomical body. When the "Primordial Qi" is completely depleted, the production of "Zheng Qi" stops, resulting in death [17] [22].

The speed at which "Primordial Qi" dissipates abnormally is determined by several factors [19] [23]. Firstly, the health status of the body plays a role. If the "Zang and Fu" organs are diseased or not functioning normally, it can lead to abnormal loss of "Primordial Qi" because a larger quantity is utilized for generating "Zheng Qi". Secondly, the fluctuation in human emotions can also affect the dissipation of "Primordial Qi". Chaotic thoughts, joy, anger, shock, and deception can consume "Primordial Qi" at a faster rate. Lastly, human reproduction, specifically excessive sexual intercourse, can accelerate the loss of "Primordial Qi" [3] [18] [22].

1.4. How Does Western Medicine Explain Aging?

Scientists have discovered that there are three components involved in the mechanism that controls how cells age. These include signals received by cells, genes in the cell's nucleus, and certain factors that affect aging after the events occurring in the nucleus [24]. When signals come into the cell, the genes and aging factors work together to determine how quickly the cell ages. The postnuclear factors include the rate at which harmful molecules are produced in the cell's mitochondria, the oxidation of fats in the cell's membrane, and the cell's ability to remove waste [24].

Postnuclear senescence effectors can cause damage to cells. One effect of this is the mitochondrial reactive oxygen species (mtROS)-induced oxidation and breaking of mitochondrial DNA (mtDNA), which produces fragments [24] [25]. These fragments can be inserted into nuclear DNA (nDNA), which can lead to various negative effects such as chromosomal misclustering, aneuploidy, disruption of genes, cell division arrest, changes in regulatory sequences, and genomic instability [25] [26]. Additionally, increased lipid peroxidation in cell membranes, particularly in mitochondria, is associated with aging. The proximity of mtROS generators to the inner membrane structure of mitochondria contributes to the oxidation of membrane lipids [27] [28].

Postnuclear senescent effectors can lead to three different outcomes for cells: 1) apoptosis or necrosis, 2) cellular senescence, and 3) dysfunction, or abnormal cell function in mitotic tissues, which can result in cancer [29]. Senescent cells release pro-inflammatory cytokines and proteins that degrade the extracellular matrix, causing inflammation in surrounding tissues. This inflammation is more harmful to tissues than cell death itself. While senescent cells are uncommon in young individuals, they accumulate in multiple tissues as people age [30].

The rate of mtROS generation is linked to lifespan because the production of ROS occurs in the microenvironment between organelles. The concentration of ROS in specific areas within cells, such as mitochondria, especially near where ROS is generated, determines the extent of oxidative damage. This dependence

on mtROS production, rather than antioxidant concentration, is crucial because mtROS determines the local ROS concentration. This is important because mtDNA, which is a key factor in aging, is located close to or in contact with substances that generate ROS. This helps explain why the production of ROS in mitochondria decreases, instead of increasing the levels of antioxidants inside cells, as long-lived species evolve [31] [32]. Furthermore, the level of unsaturated fatty acids in cell membranes, including mitochondria, is also connected to lifespan [27]. Long-lived animals have lower levels of unsaturation in their mitochondria and cell membranes, which can reduce damage caused by lipid peroxidation in these cellular compartments [33] [34].

2. Discussion

2.1. How to Delay Aging Based on TCM Theory

According to TCM, aging is due to the decline in "Primordial Qi". To stay healthy, it is important to prevent the excessive loss of "Primordial Qi". "Primordial Qi" cannot be replenished later in life, so the focus should be on reducing its loss rate. Factors like insufficient "Acquired Qi" and/or unhealthy "Zang-Fu" organs can accelerate the loss. Therefore, the key to staying healthy is to preserve "Primordial Qi" and nourish "Acquired Qi" [17] [19].

2.2. Chinese Tonifying Herbs Can Nourish "Acquired Qi"

To delay aging and prevent age-related diseases, it is crucial to continuously generate enough "Zheng Qi" (**Figure 2**) [35]. "Zheng Qi" is created by combining "Primordial Qi" and "Acquired Qi". "Primordial Qi" is given by our parents and cannot be replenished later in life. "Acquired Qi" can come from the air we breathe and the food we eat. If the production of "Acquired Qi" is reduced due to the "deficiency" in body functions, and more "Primordial Qi" will increase. On the other hand, if enough "Acquired Qi" is produced, the consumption rate of "Primordial Qi" is normal [36]. Therefore, using Chinese tonifying herbs to maintain the normal functions of the "Zang-Fu" organs can slow down the consumption of "Primordial Qi" and thereby delay the aging process (Figure 2) [37]-[39]. In this regard, it has been shown that seven TCM herbal extracts can enhance the ergogenic capacity in aged mice [40].

According to TCM, effective communication between the "Zang Xiang system" and the "anatomical physiological system" is crucial for good health [3]. However, human thoughts and desires can hinder this communication, thus affecting physical health [41]. Religious beliefs aim to calm people down in response to this issue. Chinese Qigong exercises and postures are methods to help people achieve calmness [42]. When unnecessary thoughts and desires are eliminated, the barrier between the two life systems will naturally break down, allowing communication between the "Zang Xiang system" and the "anatomical physiological system". This is known as the "unity of man and nature" [41] [43].

2.3. Delaying Aging from the Perspective of Western Medicine

Maintain mitochondrial energy-producing and signaling function

Strategies to treat aging problems should focus on addressing root causes, as this is more effective than dealing with the consequences. However, current medical technologies used to treat age-related diseases have not addressed the underlying causes of aging. This is why these therapies have limited effectiveness. One important underlying cause of aging is the rate of mitochondrial ROS production (mtROSp) [32]. As cells and organisms age, the respiratory chain becomes less effective, leading to increased electron leakage and reduced ATP production. To compensate by increasing electron transport, the level of ROS production continues to rise with age, causing more oxidative damage to mitochondria [44].

Recent research has consistently shown that mtROS is an important signaling molecule that causes changes in cells and the body. ROS can stimulate cells' antioxidant response and protect mitochondria through reverse signal transmission [45]. However, aging can lead to oxidative damage in mitochondria due to a lack of sufficient response to endogenous ROS signaling [46]. Studies have found that compounds like metformin and resveratrol can induce a low-energy state and trigger mitochondrial stress response by increasing AMP levels and activating AMPK [47]. This response has been observed in mammals during long-term aerobic exercise, which increases mitochondrial oxygen consumption without causing a harmful increase in mtROS [48]. Like dietary restriction, moderate exercise can slow the effects of aging and extend the average lifespan. However, unlike dieting, exercise does not increase the upper limit of lifespan because it primarily stimulates mitochondrial stress responses in the heart and muscles [48].

Scientists recommend using mitochondria-targeted antioxidants to protect mitochondria from oxidative damage. However, repeated trials of different targeted antioxidants have been unsatisfactory [45]. This is because these antioxidants non-specifically change the redox balance in mitochondria, causing adverse side effects and affecting mitochondrial-dominated information transmission [49]. To address this issue, scientists have recently studied specific inhibitors that act on specific locations in the mitochondria to prevent the production of mtROS. These inhibitors do not reduce ATP production or disrupt the redox balance within the mitochondria [50]. Preliminary experimental results show that this type of inhibitor can effectively prevent pathological changes caused by mtROS and may also have the potential for testing its impact on aging in the long term.

2.4. Enhance Mitophagy Activity

From the above discussion, we know that aging is often linked to problems with mitochondria, which are the powerhouses of our cells. Scientists are actively looking for compounds that can protect and improve mitochondrial function.

However, there is still a lack of safe and effective methods to enhance mitochondrial function, especially a process called mitophagy for removing damaged mitochondria [50] [51], due to the toxicity and lack of specificity of certain compounds. One promising compound is urolithin A, which can induce mitophagy, extend mitochondrial functional span, and promote healthy aging [52]. Studies have found that urolithin A improves various activities in aging rodents, such as their ability to move and exercise, and helps maintain the function of their mitochondria [53]. It also prevents the age-related loss of muscle function known as sarcopenia, as evidenced by experimental and clinical studies [54].

2.5. Destroy Senescent Cells

Scientists believe that as we age, the number of senescent cells in our body increases, which may contribute to the aging process. These cells release substances that cause inflammation, potentially accelerating aging [30]. Some natural compounds like resveratrol and catechin have been shown to have anti-aging effects, but not all of them reduce senescent cell activity [55] [56]. Fisetin and quercetin have been found to deactivate senescent cells [56]. Many compounds work by reducing oxidative damage in organs rather than directly killing senescent cells. It is expected that more natural compounds will be discovered in the future that can deactivate senescent cells. Recent studies have also found that dietary restriction can help prevent the accumulation of senescent cells in both mice and humans, without harming normal cells [57] [58].

2.6. Maintain Cellular Antioxidant Response

All living organisms that use oxygen are exposed to harmful substances called oxidants. These oxidants can come from inside the body or from outside sources. To protect themselves from these harmful effects, cells have developed a strong antioxidant system. This system helps maintain a balance between oxidants and antioxidants, which is important for the cell's survival. When this balance is disrupted and there are more oxidants than antioxidants, it leads to a condition called oxidative stress. Oxidative stress can cause damage to lipids, proteins, and DNA in cells, and has been linked to various diseases like cardiovascular and neurodegenerative diseases, cancer, diabetes, and cataracts. These diseases are often associated with aging [59] [60].

As we age, the production of harmful oxidants increases, leading to age-related diseases. Our cells rely on a transcription factor called nuclear factor erythroid 2-related factor 2 (Nrf2) to activate the antioxidant defense mechanism [61]. Nrf2 controls how our cells respond to oxidative stress and helps regulate the expression of antioxidant molecules and detoxification enzymes. The Nrf2 signaling system is crucial for our cells' defense against oxidative stress and toxins [62]. However, as we age, the capacity of the Nrf2-activated antioxidant system decreases, resulting in lower levels of antioxidants and weaker antioxidant responses to oxidative stress [63].

Glutathione (GSH) is a physiological antioxidant molecule found in cells. As we age, the level of GSH generally decreases. However, cells have systems in place to regulate GSH levels and maintain balance in the short term. These systems may involve the production and regeneration of GSH through specific enzymes [64] [65]. As we get older, the balance shifts towards more oxidative states, with the increased consumption of GSH. This is due to reactions with substances like hydrogen peroxide, lipid hydroperoxides, and electrophilic molecules. Additionally, the activity of enzymes that degrade GSH also increases with age, further contributing to the decrease in GSH levels. Another possible reason for the age-related decrease in GSH is that the system responsible for synthesizing GSH in response to oxidative stress may not function as effectively [66].

When there is a disturbance in oxidative stress or GSH homeostasis, the body typically responds by increasing GSH production. One way to maintain the cellular GSH antioxidant response to oxidative stress is by using natural compounds like stilbenes, flavonoids, catechins, curcumin, and resveratrol, which can activate Nrf2 and enhance GSH homeostasis [61] [67]. Another safer method to induce antioxidant responses is by stimulating the production of small amounts of endogenous ROS, such as during exercise [48], and using phytochemicals like ursolic acid and beta-sitosterol to stimulate mitochondrial electron transport and ATP production [68] [69]. The cytochrome P450-catalyzed metabolism of schisandrin B (an active ingredient from Schisandrae Sinensis Fructus) also produces a small amount of ROS, which triggers an antioxidant response [70] [71]. This self-limiting mechanism of stimulating cells' antioxidant response avoids adverse side effects from overreaction. Furthermore, by inducing the antioxidant response of cells, it can prevent interference with the antioxidant regulation system caused by external antioxidant molecules and inadequate response to oxidative stress.

2.7. Integrating TCM and Western Medicine to Delay Aging

TCM believes that maintaining health and delaying aging involves preserving "Primordial Qi" and nourishing "Acquired Qi" to support the generation of "Zheng Qi" and hence normal functioning of the "Zang-Fu" organs. Western medicine attributes aging to dysfunction of cell mitochondria, which leads to various aging-related diseases. In this regard, a unifying theory of aging between TCM and Western medicine has been proposed [37]. TCM's concept of "Zheng Qi" decline in aging is consistent with the "Mitochondrial decay theory in aging", in that the functional manifestation of "Zheng Qi" can be linked to the generation of ATP by mitochondria. By integrating TCM and Western medicine theories, we can potentially discover ways to effectively delay aging [10] [72] [73].

Firstly, following TCM theory, we can use Chinese tonifying herbs to support the normal functioning of "Zang and Fu" organs and nourish the "Acquired Qi". Research shows that natural compounds found in these herbs can also improve mitochondrial dysfunction, which in turn helps prevent cellular aging and age-related diseases [74] [75]. These compounds protect and remove damaged mitochondria by enhancing the oxidative stress response, antioxidant response, and mitophagy activity [74]. Lastly, these safe and effective natural compounds can eliminate senescent cells in various organs and prevent or reduce age-related inflammations [76] [77].

The integration of TCM and Western medicine can help delay aging. This approach focuses on the "Zang Xiang system" in TCM as well as targets cell mitochondria in Western medicine. By incorporating a balanced and healthy diet, regular exercise, proper work-and-rest balance, and emotional regulation, one can achieve the "unity of nature and man". This can effectively delay aging and potentially enable individuals to live longer, up to a hundred years old.

3. Conclusion

TCM and Western medicine are two distinct medical systems, but they both aim to prevent and treat diseases. TCM has methods for preventing diseases and delaying aging. TCM believes that the decline in the "Zheng Qi" generation causes aging. Western medicine has also been studying the causes of aging and exploring ways to delay it. Research shows that cell mitochondria, which generate ATP to support cell functions, also produce ROS, which affects mitochondria/cell functions and leads to aging. As mitochondria are the cellular source of "Qi", we need to maintain mitochondrial function to produce "Qi" and support normal life activities, thereby retarding the aging process. TCM provides methods to slow down the dissipation of "Primordial Qi" and enhance the generation of "Acquired Qi", thus sustaining the generation of "Zheng Qi" in the body. By combining TCM and Western medicine, we can use effective methods to increase healthy lifespan by addressing deficiencies in "Yin and Yang" and "Qi and Blood" functions, regulating emotions, and preserving mitochondrial structural and functional integrity.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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