Background

Since the middle of the 19th century, German pathologist Rudolf Virchow proposed that tumors originate from chronic inflammation [1]. At present, the medical community has determined that inflammation is closely related to the occurrence, development and efficacy of anti-cancer treatment [2]. Recently, an “anti-inflammatory diet” that claims to have functions such as cancer prevention has attracted much attention. To unveil the magic of the “anti-inflammatory diet”, let’s start with the concept of inflammation, which is the core of the “anti-inflammatory diet”.

The correlation between inflammation and cancer

Inflammation is the soil of many diseases, and in 2021, the Journal of the American College of Cardiology published an article in the tumor sub-issue pointed out that cancer and cardiovascular disease have a common pathophysiological basis, and inflammation is one of the main causes. When the body is stimulated by pathogen infection, tissue damage and other stimuli, the body’s “guards” (such as immune cells, C-reactive protein, interleukin, etc.) will respond quickly to defense [3]. If it is compared to a “war”, then the intensity of this “war” can be reflected by the redness, swelling, heat and pain of the body part, which is the most common symptom of acute inflammation, and severe cases can also cause systemic reactions such as fever. Usually, the body’s “guardians” can win in a short period of time, quickly eliminate the irritant, and thus end this “battle of inflammation”. But if the stimulus cannot be completely eliminated and continues to exist in small amounts. In that case, the body’s “guards” will continue to receive combat instructions to rush to the battlefield, and the war will evolve into a protracted war, that is, chronic inflammation [4]. Chronic inflammation features in mononuclear immune cell infiltration, tissue destruction, fibrosis and angiogenesis. There is also increased genome damage, promote DNA synthesis, promote cell proliferation, destroy DNA repair pathways, inhibit apoptosis, etc., which are also associated with chronic inflammation. Chronic inflammation, although usually without obvious symptoms, means that the body is constantly in a state of high alertness.

Studies have shown that more than 50% of deaths are associated with chronic inflammation, such as ischemic heart disease, stroke, cancer, diabetes, chronic kidney disease, nonalcoholic fatty liver disease, and autoimmune and neurodegenerative diseases [5]. Chronic inflammation is an important factor in causing cancer and promoting the development of cancer [6]. At the same time, chronic inflammation leads to the upregulation of genes of pro-inflammatory factors, such as cytokines, inducible nitric oxide synthase, reactive oxygen species and NF-κB, which in turn provides a favorable environment for the growth and metastasis of cancer cells. Chronic inflammation has been clarified to be one of the culprits in the development and progression of many tumors [7]. For example, gastric cancer is associated with Helicobacter pylori infection, nasopharyngeal cancer is associated with herpesvirus infection, and liver cancer is associated with hepatitis virus infection. Systemic inflammation such as obesity and depression is also associated with the incidence of tumors and poor efficacy of anti-cancer therapy. At the same time, the inflammatory response induced by treatment also affects the clinical treatment effect of tumors to varying degrees.

Foods that fight off inflammation

Studies have shown that an “anti-inflammatory diet” is one way to control the body’s chronic levels of inflammation potentially. The anti-inflammatory diet consists of two aspects: eating more “anti-inflammatory foods” and eating less “pro-inflammatory foods”. The South Carolina Cancer Control Program sets the Dietary Inflammatory Index (DII) to determine whether a diet is “anti-inflammatory”. It can successfully predict the diet’s impact on inflammatory markers, such as hsCRP and IL-6 [8]. Studies have shown that diets with higher DII scores (also known as “pro-inflammatory diets”) are associated with increased rates of colorectal and prostate cancer [9]. One study evaluated nutrients and some phytochemicals commonly found in the daily diet, including trans fats, saturated fats, cholesterol, energy, carbohydrates and proteins. In a sense, anti-inflammatory ingredients also determine anti-inflammatory foods, combined with the recommendations of the Harvard School of Public Health, “anti-inflammatory foods” mainly include fresh fruits and vegetables, whole grains, soy products, nuts and fish, roughly including: 1. tomato: rich in vitamin C, lycopene and other phytochemicals; 2. olive oil: rich in monounsaturated fatty acids, rich in plant compounds; 3. green leafy vegetables, such as spinach, magnesium, flavonoids, dietary fiber in kale are all anti-inflammatory components; 4. almonds, walnuts may be rich in N-3 and N-6 series fatty acids; 5. fatty fish such as salmon, mackerel, tuna and sardines are rich in N-3 series fatty acids; 6. fruits such as strawberries, blueberries, cherries and oranges, containing dietary fiber, magnesium, anthocyanins, flavonoids, 7. other anti-inflammatory foods, including: legumes and whole grains (such as barley, oats and bran), because they are rich in dietary fiber; dark chocolate, tea, apples, citrus, onions, soybeans and coffee, because they contain various polyphenols; some spices, such as turmeric, garlic and ginger.

In summary, anti-inflammatory foods mostly refer to plant foods. Vegetables and fruits are rich in vitamins, polyphenols, etc., which help reduce inflammation in the body [10]. The dietary fiber in whole grains combined with carcinogens improves intestinal epithelial tissue proliferation and reduces inflammatory cytokine levels [11]. Also, the lipopolysaccharide inside the whole grain can stimulate phagocytes, NK cells and T cells, immune cells that recognize and destroy cancer cells [12]. Some of the ingredients in these “anti-inflammatory foods”, such as the Ω-3 fatty acids found in fish, can protect the body from possible damage caused by inflammation, partly through inhibiting the production of the aforementioned body’s “guardians” and help regulate inflammation-related pain [13].

Foods that promote inflammation

On the contrary, “pro-inflammatory food” can promote the development of inflammation and mainly refers to high-sugar, high-salt, high-fat processed foods, such as processed meat products...
and fried foods [14]. The ω-6 fatty acids inside pro-inflammatory food are the “accomplices” of inflammation, and eating too much is undoubtedly “adding fuel to the fire” of inflammation [15]. The “anti-inflammatory diet” is not only for people with high levels of chronic inflammation but for the general population; the “anti-inflammatory diet” is also a dietary pattern worth advocating and can help further promote health. According to the dietary inflammation index scoring method, the following five types of pro-inflammatory foods: high-sugar foods, delicate carb foods (white rice, steamed buns, white bread, macaroni, cakes, biscuits, etc.); high-fat foods, fried foods; red meat, processed meat; trans fatty acids; a high-salt diet, improperly consumed can become an “accelerator” for cancer.

**Ways to eat properly**

Whether food is anti-inflammatory is only one dimension of many health attributes; simply using anti-inflammatory food to pile up into three meals a day, abandoning the premise of food diversity and balanced matching, it is not wise to simply pursue anti-inflammatory.

Interestingly, some known healthy diets, such as the Mediterranean diet and the DASH diet, have always promoted the intake of high-quality fats, potassium, dietary fiber, and controlled saturated fats and refined sugars, which themselves have a strong anti-inflammatory effect. Diets with lower DII scores currently confirmed by studies include the Mediterranean diet and the macrobiotic diet, which may be a good dietary choice [16, 17]. The real positive anti-inflammatory diet should be to eat as many foods as possible with better anti-inflammatory functions in each category under the most balanced dietary structure. Specifically, according to the expert consensus of anti-inflammatory diet to prevent tumors", based on the perspective of anti-inflammatory diet and the dietary characteristics of Chinese residents, the following recommendations are made: whole grain carbohydrates in carbohydrates have anti-inflammatory effects and are conducive to maintaining stable blood sugar levels. Fat intake generally does not exceed 30% of total energy, it is advisable to choose monounsaturated fatty acids and polyunsaturated fatty acids and reduce the intake of saturated fatty acids and trans fatty acids, which is conducive to the formation of the body’s anti-inflammatory internal environment. Protein has a slight pro-inflammatory potential, but due to the metabolic disorder of tumor patients, protein consumption increases, it is recommended that tumor patients increase protein intake, and the recommended protein intake is 1–1.5 g/kg/d. In an ideal anti-inflammatory diet, vegetables and fruits should make up 2/3 of the total food weight. The flavonoids, anthocyanins and butylbenzoates in some plant compounds have great anti-inflammatory potential and have positive effects on tumor prevention and treatment, but their dosage and treatment course in tumor prevention and treatment need to be further studied. Although alcohol has anti-inflammatory potential, in the prevention and treatment of tumors, long-term excessive or heavy drinking should be avoided, and tumor patients should abstain from alcohol. Green/black tea has anti-inflammatory biological activity and can be consumed in moderation according to personal health conditions and habits. The cooking method of the anti-inflammatory diet should be healthy, and it should be mainly stewed, stir-fried, steamed, and boiled, and less frying, frying, roasting and other methods.

In addition to diet, lifestyles such as less activity and sleep are also associated with chronic inflammation. Low-intensity physical activity has been found to be associated with increased levels of C-reactive protein and pro-inflammatory cytokines in healthy individuals and patients with type 2 diabetes. In addition, obesity, chronic psychological stress, irregular sleep, or poor quality are all associated with high levels of chronic inflammation. Therefore, taking corresponding measures can prevent and control chronic inflammation to a certain extent, such as 4–5 aerobic exercises per week, relaxing through meditation, yoga and other activities, and developing healthy sleep habits.

In conclusion, chronic inflammation is a common and harmful abnormal body state. However, due to its insidious development, it is difficult to get attention in the early stage of the disease. Therefore, we should start now and take measures to prevent chronic inflammation. “Anti-inflammatory diet” can indeed reduce the level of chronic inflammation to a certain extent; at the same time, we should also pay attention to a balanced diet, develop moderate exercise, weight control, maintain mental health, regular sleep and other healthy lifestyles, so as to calm the “tug of war” of chronic inflammation – cancer as soon as possible!

**References**


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Author contributions
Yao QH conducted the investigation, wrote and reviewed the manuscript. The author has read and approved the final manuscript.

Competing interests
The authors declare no conflicts of interest.

Acknowledgement
This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Abbreviations
DII, Dietary Inflammatory Index.

Citation

Executive editor: Guang-Ze Ma.

Received: 19 July 2023; Accepted: 19 July 2023; Available online: 20 July 2023.

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