

# Immunotherapy and Dietary Selection

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## Abstract

Compromised immune function and immune environment in cancer patients create a situation where the immune system is unable to effectively detect and eliminate cancer cells. This allows tumors to grow and evade immune surveillance, leading to disease progression. Understanding these immune-related challenges is crucial for developing effective cancer treatments, such as immunotherapies, that aim to boost the immune response against cancer. Except for the conventional treatments, dietary interventions have been found to help patients by potentially improving their immune function by nutritional support, immune system boost, gut microbiome influence, etc. Also, it's indispensable to notice that dietary interventions should be personalized, taking into account the specific needs, preferences, and tolerances of each cancer patient. This review aims to emphasize the importance of applying well modified and proper dietary in improving anti-cancer immunity of cancer patients.

**Keywords:** dietary intervention; immunotherapy; cancer; nutrition

## Introduction

Poor immune function and immune environment are common characteristics of cancer patients [1,2]. Patients with cancer often possess compromised immune system with less efficiency at recognizing and eliminating cancer cells. Such situation can be attributed to various factors. For instance, Cancer cells can release certain substances that suppress the immune system, preventing it from mounting an effective response against the tumor. These substances may include cytokines, growth factors, and regulatory T cells, among others; Moreover, tumor Microenvironment: The tumor creates a unique environment that actively hampers the immune response. It recruits immune cells such as myeloid-derived suppressor cells (MDSCs) and tumor-associated macrophages (TAMs) that suppress immune activity and promote tumor growth. In addition, T cells are a crucial component of the immune system responsible for recognizing and eliminating cancer cells. However, in cancer patients, T cells can become dysfunctional or exhausted. This means they lose their ability to effectively target and destroy cancer cells. Antigen-presenting cells (APCs) play a critical role in presenting tumor antigens to T cells, triggering an immune response. However, in cancer patients, the function of APCs can be

impaired, leading to reduced activation of T cells and weakened immune response. Chronic inflammation can also contribute to the development and progression of cancer. Inflammatory cytokines and chemokines produced in response to the tumor can create an environment that promotes tumor growth and suppresses immune function. However, except for the conventional cancer treatment, dietary intervention has been reported to contribute in rebuilding the immunology of cancer patient. Therefore, apply the dietary intervention wisely for cancer patient is also important for increasing clinical benefits of patients [3,4].

## Advantages of applying dietary intervention for regulating immunology in cancer patients

Improving immunology through dietary interventions is an area of growing interest in cancer research and treatment. Diet alone cannot treat cancer; however, certain dietary factors can potentially regulate immune function and support the immune system in its fight against cancer. However, well organized dietary interventions are good for improving immunology in cancer patients [5-8].

✚ Nutritional Support: Cancer and its treatments can place significant nutritional demands on the body. A well-balanced diet that includes adequate

protein, vitamins, minerals, and antioxidants is essential for maintaining overall health and supporting the immune system [9-11].

- ✚ Immune System Boost: Certain foods and nutrients have been found to have immunomodulatory properties, meaning they can positively influence immune function. For example, fruits and vegetables rich in antioxidants, such as berries, leafy greens, and citrus fruits, may help reduce oxidative stress and inflammation, supporting immune health [12].
- ✚ Gut Microbiome Influence: The gut microbiome plays a crucial role in immune regulation. A healthy gut microbiome can help enhance immune function and reduce inflammation. Consuming a diet rich in fiber, prebiotics (found in foods like onions, garlic, and bananas), and probiotics (found in fermented foods like yogurt and sauerkraut) can promote a diverse and balanced gut microbiome.
- ✚ Anti-inflammatory Effects: Chronic inflammation can promote cancer progression and weaken immune function. Several dietary components, such as omega-3 fatty acids found in fatty fish, walnuts, and flaxseeds, have anti-inflammatory properties that may help modulate immune responses and reduce inflammation.
- ✚ Weight Management: Obesity and excess body weight are associated with chronic inflammation and a higher risk of certain cancers. Maintaining a healthy weight through a balanced diet and regular exercise can help regulate immune function and reduce the risk of cancer development and progression.
- ✚ Individualized Approach: It's important to note that dietary interventions should be tailored to the individual needs and tolerances of each cancer patient. Factors such as the type and stage of cancer, treatment protocols, and existing health conditions should be considered when designing dietary plans.
- ✚ While dietary interventions can complement conventional cancer treatments and potentially improve immune function, it's crucial to consult with healthcare professionals, such as oncologists and registered dietitians, to ensure that dietary recommendations align with the specific needs and goals of each cancer patient [13, 14].

## Selecting proper dietary intervention

Dietary interventions can potentially regulate immunology and support the immune system in cancer patients. Here, we summarized some dietary factors that may have a positive impact on immune function [15-18].

- ✚ Fruits and Vegetables: Consuming a variety of fruits and vegetables provides essential vitamins, minerals, and antioxidants that support immune health. Food's rich in vitamin C (such as citrus fruits, berries, and bell peppers) and vitamin A (found in carrots, sweet potatoes, and leafy greens) are particularly beneficial.
- ✚ Omega-3 Fatty Acids: Found in fatty fish (like salmon and mackerel), walnuts, flaxseeds, and chia seeds, omega-3 fatty acids have anti-inflammatory properties that may help regulate immune responses and reduce inflammation.
- ✚ Fiber-Rich Foods: A diet high in fiber, obtained from whole grains, legumes, fruits, and vegetables, can support a healthy gut microbiome. The gut microbiome plays a crucial role in immune regulation, and a diverse and balanced microbiome is associated with better immune function.
- ✚ Probiotics and Fermented Foods: Probiotics, which are live beneficial bacteria, can be found in foods like yogurt, kefir, sauerkraut, and kimchi. Consuming probiotics and fermented foods help promote a healthy gut microbiome, which in turn supports immune health.
- ✚ Lean Proteins: Including lean proteins in the diet, such as poultry, fish, legumes, and tofu, provides essential amino acids for building and repairing immune cells. Protein is necessary for the production and function of immune cells and antibodies.
- ✚ Antioxidant-Rich Foods: Antioxidants found in foods like berries, dark chocolate, green tea, and spices (such as turmeric and ginger) help reduce oxidative stress and inflammation, supporting immune function.
- ✚ Hydration: Staying hydrated is important for overall health, including immune function. Drinking an adequate amount of water and consuming fluids like herbal teas or homemade broths can help maintain proper hydration.

Above all, it's important to note that while certain dietary factors may have potential immunomodulatory effects, there is no one-size-fits-all approach. Dietary interventions should be personalized and consider individual factors such as

cancer type, treatment plan, overall health, and any existing dietary restrictions or sensitivities [19-25].

## Conclusion

A dietary approach aimed at improving anti-cancer immunity can be beneficial for cancer patients, particularly those whose immunity has been compromised by anti-cancer therapy. dietary strategy is helpful. Anti-cancer therapies, such as chemotherapy, radiation, and immunotherapy, can have side effects that weaken the immune system. A nutrient-rich diet can provide essential vitamins, minerals, and antioxidants that support immune function, helping to restore and strengthen the immune system in cancer patients. In addition, cancer patients undergoing treatment often have a higher susceptibility to infections due to compromised immunity. A balanced diet, rich in nutrients, can help improve the body's defense mechanisms and reduce the risk of infections.

Adequate nutrition is crucial for tissue repair, wound healing, and overall recovery. A well-rounded diet provides the necessary nutrients, such as proteins, vitamins, and minerals, which are vital for repairing damaged tissues and supporting the body's recovery processes after anti-cancer therapy. Moreover, some dietary components may help alleviate side effects associated with anti-cancer therapy. For example, consuming ginger or ginger-containing foods may help reduce chemotherapy-induced nausea, while consuming high-fiber foods can help manage constipation caused by certain medications.

Cancer treatments can lead to weight loss, muscle wasting, and malnutrition. A carefully planned diet can help maintain a healthy weight, preserve muscle mass, and provide adequate energy and nutrients necessary for the body's functioning and healing. Some dietary components, such as fruits, vegetables, and omega-3 fatty acids, possess antioxidant and anti-inflammatory properties. These can help counteract oxidative stress, reduce inflammation, and promote overall immune health, which is particularly important for cancer patients. Finally, a healthy gut microbiome plays a crucial role in immune function. Consuming a diet rich in fiber, prebiotics, and probiotics can promote a diverse and balanced gut microbiome, supporting immune health and potentially mitigating treatment-related gastrointestinal issues. It's important to notice that dietary interventions should be personalized, taking

into account the specific needs, preferences, and tolerances of each cancer patient.

## Declarations

### Ethical Approval

Not applicable.

### Availability of data and materials

Not applicable.

### Competing interests

The author declares no competing interests.

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