

Role of dietary components in human immune system.

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ABSTRACT: The immune system is the body's defence against infections. The immune system attacks germs and helps keep us healthy. Humans have three types of immunity — innate, adaptive, and passive: Without an immune system, we would have no way to fight harmful things that enter our body from the outside or harmful changes that occur inside our body. For supporting immune health and preventing illness, dietary components (nutrition's) have most beneficial effects. Dietary components comprised of foods known to have immunity-boosting qualities. Based on a variety of systematic and clinical data, vitamins A, B₆, B₁₂, C, D, E, folate, zinc, iron, copper, and selenium are particularly important to boosting immune response. A diet that includes lots of fruits and vegetables high in vitamins A and C including citrus fruits such as oranges and grapefruit, foods with vitamin E such as avocado, and lean meats and legumes as sources of protein can be low in fat, low in calories and delicious, supported The optimum immune system which can reduce the risk of infections, So we can say that dietary components is quitessential to improving immunity.

Keywords: Immunity, dietary components, illness,

I. INTRODUCTION

Our immune system is essential for our survival. Without an immune system, our bodies would be open to attack from bacteria, viruses, parasites, and more. It is our immune system that keeps us healthy as we drift through a sea of pathogens.

What Are the Parts of the Immune System?

Many cells and organs work together to protect the body. White blood cells, also called **leukocytes** (LOO-kuh-sytes), play an important role in the immune system.

Some types of white blood cells, called **phagocytes** (FAH-guh-sytes), chew up invading organisms. Others,

called **lymphocytes** (LIM-fuh-sytes), help the body remember the invaders and destroy them. [Song et al, 2019]

One type of phagocyte is the **neutrophil** (NOO-truh-fil), which fights bacteria. When someone might have bacterial infection, doctors can order a blood test to see if it caused the body to have lots of neutrophils. Other types of phagocytes do their own jobs to make sure that the body responds to invaders.

The two kinds of lymphocytes are **B lymphocytes** and **T lymphocytes**. [Cohen 2017] Lymphocytes start out in the bone marrow and either stay there and mature into B cells, or go to the thymus gland to mature into T cells. B lymphocytes are like the body's military intelligence system — they find their targets and send defences to lock onto them. T cells are like the soldiers — they destroy the invaders that the intelligence system finds.

1.1How Does the Immune System Work?

When the body senses foreign substances (called antigens), the immune system works to recognize the antigens and get rid of them. [Malter M et.al 2019]

B lymphocytes are triggered to make **antibodies** (also called **immunoglobulin's**). These proteins lock onto specific antigens. After they're made, antibodies usually stay in our bodies in case we have to fight the same germ again. That's why someone who gets sick with a disease, like chickenpox, usually won't get sick from it again.

This is also how immunizations (vaccines) prevent some diseases. An immunization introduces the body to an antigen in a way that doesn't make someone sick. But it does let the body make antibodies that will protect the person from future attack by the germ.

Although antibodies can recognize an antigen and lock onto it, they can't destroy it without help. That's the job of the **T cells**. They destroy antigens tagged by antibodies or cells that

are infected or somehow changed. (Some T cells are actually called "killer cells.") T cells also help signal other cells (like phagocytes) to do their jobs. [Marcos et al, 2003]

Antibodies also can:

- neutralize toxins (poisonous or damaging substances) produced by different organisms
- activate a group of proteins called **complement** that are part of the immune system. Complement helps kill bacteria, viruses, or infected cells.

These specialized cells and parts of the immune system offer the body protection against disease. This protection is called immunity.

Humans have three types of immunity — innate, adaptive, and passive:

- **Innate immunity:** Everyone is born with innate (or natural) immunity, a type of general protection. For example, the skin acts as a barrier to block germs from entering the body. And the immune system recognizes when certain invaders are foreign and could be dangerous.
- **Adaptive immunity:** Adaptive (or active) immunity develops throughout our lives. We develop adaptive immunity when we're exposed to diseases or when we're immunized against them with vaccines.
- **Passive immunity:** Passive immunity is "borrowed" from another source and it lasts for a short time. For example, antibodies in a mother's breast milk give a baby temporary immunity to diseases the mother has been exposed to.

1.2 how to develop immunity

When we talk about developing immunity we essentially talk about developing innate immunity – which is general and non-specific.

1. Body heals & regenerates itself when you sleep. To develop Immunity you must get adequate sleep and people who get inadequate / poor quality sleep are more prone to be sick.

A Sleep of at least 7 hours for adults, 8-9 hours for teenagers and up-to 14 hours for infants is recommended.

2. Sugar additives and carbohydrates contribute to weight gain resulting in obesity, which is a risk factor for sickness of any type. High sugar consumption also increases risk of Diabetes and Heart Disease. Hence reduction in sugar consumption raises overall level of immunity as well as risk of above conditions. Indian Council of

Medical Research (ICMR) recommends daily sugar intake of 30 gms. / Day.

3. Eating foods rich in certain Vitamins strengthen immunity system and keep illnesses at bay. These include: [Rinninella E,et al.2019]

a) Vitamin C, which strengthens immune system. Vitamin C can't be stored or produced by body, so it is necessary to consume it daily in adequate quantity. Foods rich in Vitamin C are: Orange, Red Cherries, Green Chili Peppers, Guava, and Spinach.

b) Vitamin B6 supports Bio-Chemical Reactions in Immunity system. Foods that are rich in Vitamin B6 include Wholegrain Cereals, Eggs, Vegetables, Soyabean, Breakfast Cereals, and Banana.

c) Vitamin E contains strong Oxidants that help protect body cells from damage by free radicals. It also strengthens body immunity and helps it fight invading viruses and bacteria. Major sources of Vitamin E are Oils like Sunflower and Safflower, Nuts (almonds, peanuts, and hazelnuts), Seeds & Green vegetables like Spinach & Broccoli
Zinc, Iron, Copper and Folic acid also help in building up immune system.

4. Control Stress Levels: Chronic Stress leads to high level of Hormone Cortisol. Continuously high levels of Cortisol prevent the immune system from doing its assigned job of protecting body from invading viruses & bacteria.

Besides adopting a calm & equanimous attitude to life, stress can be lowered by meditation, yoga & breathing exercises.

5. Drink Alcohol in Moderation: Excessive drinking can weaken immune system. If you drink regularly you may find you are more prone to colds and flus. Excessive drinking weakens cells T and C cells in your immune system and lowers your body immunity. If you must drink, drink in moderation.

6. Don't Smoke Cigarettes: Any kind of toxins can compromise your immune system. Cigarette Smoke contains Nicotine, Carbon Monoxide and Nitrogen Oxides; that can impede growth and action of immune cells

7. Manage Chronic Conditions: Chronic conditions like Diabetes & Heart Disease, unless managed properly, can cause an inflammatory response that weakens body's immune system. If you suffer from a chronic condition and develop an infection, body has to work extra hard to recover. But if chronic condition is well managed it frees reserves to fight infection.

8. Regular Exercise: Regular exercise can contribute to general good health & build up immunity against infections. It also encourages circulation which helps immune cells move through

body unhindered and perform their function effectively.

9. Take steps to minimize infection by washing your hands frequently and washing vegetables, fruits, cooking meats.

1.3 Diet and your immune system

Balance diet is fundamental to improving immunity.

The WHO guidance on diet, especially during the current pandemic states that “good nutrition is crucial for health; particularly in times when the immune system might need to fight back” (WHO, 2020).

Increasing our body’s immunity is the need of the hour! Certainly, there a lot of immune boosters this can help us in fighting any disease entering our body. These strong immune boosters include green leafy vegetables as they contain countless number of nutrients, nuts as they contain healthy fats, fiber rich food as it helps in digestion, whole grains and cereals as they contain nutrients, all fruits as they provide energy, dairy products as they are calcium-rich, and fish in sea food as it is rich in omega-3 fatty acids

These diet materials can be categorised as:

- macronutrients – carbohydrates, proteins, fats and oils
- micronutrients – vitamins and minerals
- dietary fibre – cellulose, pectin and gums
- dietary water – keeping the body hydrated
- phytochemicals – biologically active compounds from fruits and vegetables.

Incorporating specific foods into the diet are believed to work collectively to support an optimum immune system. Based on a variety of systematic and clinical data, vitamins A, B₆, B₁₂, C, D, E, folate, zinc, iron, copper, and selenium (read our Vitamin and Mineral: a brief guide) are particularly important to boosting immune response.

Healthy food is essential for a strong immune system. No one food or supplement can prevent illness. But by including nutrients rich healthy food in our eating plan on a regular basis can definitely help support our immune system.

Here I am sharing some healthy food ingredients from your kitchen which you can easily include to your regular eating plan to boost your immunity. [Marcos, A., Nova, E. & Montero, A (2003)]

1.4 Foods Which boost the immune system.....

A healthful, balanced diet plays a vital role in staying well. The following foods may help to boost the immune system: [Allen K.2018]

1. Blueberries

Blueberries have antioxidant properties that may boost the immune system.

Blueberries contain a type of flavonoid called anthocyanin, which has antioxidant properties that can help boost a person’s immune system. A 2016 study noted that flavonoids play an essential role in the respiratory tract’s immune defense system.

Researchers found that people who ate foods rich in flavonoids were less likely to get an upper respiratory tract infection, or common cold, than those who did not.

2. Dark chocolate

Dark chocolate contains an antioxidant called theobromine, which may help to boost the immune system by protecting the body’s cells from free radicals.

Free radicals are molecules that the body produces when it breaks down food or comes into contact with pollutants. Free radicals can damage the body’s cells and may contribute to disease.

Despite its potential benefits, dark chocolate is high in calories and saturated fat, so it is important to eat it in moderation.

3. Turmeric

Turmeric is a yellow spice that many people use in cooking. It is also present in some alternative medicines. Consuming turmeric may improve a person’s immune response. This is due to the qualities of curcumin, a compound in turmeric.

According to a 2017 review, curcumin has antioxidant and anti-inflammatory effects.

4. Oily fish

Salmon, tuna, pilchards, and other oily fish are a rich source of omega-3 fatty acids.

According to a 2014 report, long-term intake of omega-3 fatty acids may reduce the risk of rheumatoid arthritis (RA).

RA is a chronic autoimmune condition that occurs when the immune system mistakenly attacks a healthy part of the body.

5. Broccoli

Broccoli is another source of vitamin C. It also contains potent antioxidants, such as sulforaphane. For these reasons, it is a good choice of vegetable to eat regularly to support immune system health.

6. Sweet potatoes

Sweet potatoes are rich in beta carotene, a type of antioxidant that gives the skin of the potatoes its orange colour.

Beta carotene is a source of vitamin A. It helps to make skin healthy and may even provide some protection against skin damage from ultraviolet (UV) rays.

7. Spinach

Spinach may boost the immune system, as it contains many essential nutrients and antioxidants, including:

- flavonoids
- carotenoids
- vitamin C
- vitamin E

Vitamins C and E can help support the immune system.

Research also indicates that flavonoids may help to prevent the common cold in otherwise healthy people.

8. Ginger

People use ginger in a variety of dishes and desserts, as well as in teas.

According to a review, ginger has anti-inflammatory and antioxidative properties and is likely to offer health benefits. However, more research is necessary to confirm whether or not it can effectively prevent illness.

9. Garlic

Garlic may help to prevent colds.

Garlic is a common home remedy for the prevention of colds and other illness.

One review looked at whether taking garlic supplements containing allicin reduced the risk of getting a cold.

The group of participants taking a placebo had more than double the number of colds between them than those taking the garlic supplements. However, the researchers concluded that more research is necessary to determine whether or not garlic can help to prevent colds.

10. Green tea

Green tea contains only a small amount of caffeine, so people can enjoy it as an alternative to black tea or coffee. Drinking it may also strengthen the immune system.

As with blueberries, green tea contains flavonoids, which may reduce the risk of a cold.

11. Kefir

Kefir is a fermented drink that contains live cultures of bacteria that are beneficial for health.

Initial research suggests that drinking kefir may boost the immune system. According to a 2017 review, various studies have shown that regular consumption of kefir can help with:

- fighting bacteria
- reducing inflammation
- increasing antioxidant activity

The majority of the research that supports this was carried out on animals or in a laboratory. Researchers need to perform additional studies to understand how kefir may prevent disease in humans.

12. Sunflower seeds

Sunflower seeds can make a tasty addition to salads or breakfast bowls. They are a rich source of vitamin E, an antioxidant.

In the same way as other antioxidants, vitamin E improves immune function. It does this by fighting off free radicals, which can damage cells.

13. Almonds

Almonds are another excellent source of vitamin E. They also contain manganese, magnesium, and fiber.

A small handful or a quarter of a cup of almonds is a healthful snack that may benefit the immune system.

14. Oranges or kiwifruit (kiwis)

Oranges and kiwis are an excellent source of vitamin C, which is the vitamin that many people turn to when they feel a cold developing.

While scientists are still not sure exactly how it helps, vitamin C may reduce the duration of common cold symptoms and improve the function of the human immune system.

15. Red bell pepper

For people trying to avoid the sugar in fruit, red bell peppers are an excellent alternative source of vitamin C.

Stir-frying and roasting both preserve the nutrient content of red bell peppers better than steaming or boiling, according to a study on cooking methods

II. CONCLUSIONS

In this Special Issue, the collected works provide a breadth of reviews and research indicating the key role of dietary components in human immune system. Dietary components are crucial for supporting immune health and preventing illness. Dietary components may impact directly or indirectly upon immune cells causing changes in their function or may exert effects via changes in the gut micro biome. So the study shown that the balanced dietary components are fundamental to improving immunity.

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