

<https://doi.org/10.48047/AFJBS.6.13.2024.4756-4773>**African Journal of Biological Sciences**Journal homepage: <http://www.afjbs.com>

Research Paper

Open Access

THE RELATIONSHIP OF FOOD TO HUMAN BODY IMMUNITY

Nguyen Thi Thu Ha – Graduate academy of social sciences, Hanoi, Vietnam; Email: Hantt.neu@gmail.com

Pham Huyen Minh Ngoc - Chu Van An High School, Hanoi, Vietnam; Email: jadepham2502@gmail.com

Nguyen Anh Dung, VNU – International School

Nguyen Thi Kim Oanh. Department of Marketing, Thuongmai University, Hanoi, Viet Nam; Email: kimoanh@tmu.edu.vn

Article History

Volume 6, Issue 13, July 2024

Received: 04 June 2024

Accepted: 05 July 2024

Published: 31 July 2024

doi:

10.48047/AFJBS.6.13.2024.4756-4773

Abstract: Proper nutrition is fundamental to enhancing immune capabilities. The immune system protects against diseases and infections, and it is well-established that factors such as stress, sleep, and nutrition impact its functionality. Immunity is a crucial aspect of health. Besides adequate nutrient intake, daily healthy activities are also vital for boosting immunity in adults. This study presents the relationship between food and human body immunity, offering solutions to enhance bodily resistance.

Keywords: food, immunity, human body

Introduction

A healthy, balanced diet supports the immune system well. When dietary intake is insufficient, supplementing with functional foods becomes necessary. Vitamins, minerals, and other supplements have been proven to play a significant role in supporting immune functions, potentially reducing incidences of colds or flu. A healthy body is disease-free and robust, with both physical and mental factors in a healthy state. To maintain such health, strong immunity is essential to ward off harmful external agents and recover quickly if disease strikes. A person with strong immunity has a healthy immune system. Conversely, weak immunity leads to a compromised immune system, increasing the risk of infectious diseases, more severe illnesses, and prolonged recovery times. In Vietnam, functional foods have recently gained cautious acceptance among the public but are slowly becoming more widespread. The crowd mentality in Vietnam has also made it a promising land for multi-level marketing. Social and environmental issues, concerns about food safety and sanitation, and health worries have made functional foods a beacon of hope for many individuals and families. According to the Ministry of Health, functional foods are used to support the functions of body organs, providing nutritional benefits, comfort, increased resistance, and reducing disease risks. Natural foods already offer sufficient nutrients and benefits for bodily functions, preventing diseases, and even healing capabilities. This knowledge has been known since ancient times. However, due to various reasons such as habits, taste preferences, living environments, and economic capabilities, not everyone knows or

can afford to eat a well-rounded diet of natural foods. Therefore, appropriately supplementing missing nutrients to achieve a balanced diet is crucial.

Awareness of the role of food concerning health plays a significant role in the acceptance of products. Past beliefs about the role of food have included its impact on individual health (Hilliam, 1996), benefits of being healthy (Childs, 1997), health requirements awareness (Bech-Larsen & Grunert, 2003), and beliefs about the disease-preventing characteristics of natural foods (Childs, 1997). All studies agree on a positive relationship between food awareness concerning health and the acceptance or interest in purchasing functional foods. In recent years, consumer demands in the food industry have significantly changed (Siró et al., 2008). Food not only satisfies hunger and provides essential nutrients but also prevents nutrition-related diseases and improves physical and mental health (Menrad, 2003). Siegrist and Kastholz (2008) concluded that consumers who trust the food industry are more likely to buy functional foods than those who do not.

1. Overview of Resistance

1.1. Concept of Resistance

Resistance is the body's natural defense mechanism against dangerous pathogens such as parasites, fungi, bacteria, and viruses that enter the body. Stronger resistance enhances the body's immune capabilities, repelling and eliminating pathogens like infectious diseases, allergies, respiratory illnesses, digestive diseases, chronic conditions, some forms of arthritis, and cancer. Conversely, weak resistance means a weakened immune system, increasing the risk of infectious diseases, severe progression, prolonged illness, and a high recurrence rate.

So, how do resistance and the immune system relate? They are directly linked. The immune system includes cells and proteins that protect the body, while resistance refers to the protective capability of the immune system. A healthy immune system responds well to pathogens, improving the body's resistance to diseases.

To maintain good health, it's essential to build and maintain strong resistance along with a responsive immune system. Each individual's resistance varies, formed from the fetal stage and continuing to develop through birth and adulthood. Differences arise from innate factors such as genetics, gender, age, dietary habits, and physical activity. Therefore, some individuals are born healthy with strong resistance but may become weaker due to inactivity and unhealthy eating leading to obesity. Conversely, some born weak can develop strong resistance through exercise, disciplined sports training, and selective eating.

1.2. Strong Resistance as the Key to Combating Diseases

Weak resistance means an unhealthy immune system, leading to various potential diseases such as allergies, autoimmune diseases, or immunodeficiency. Therefore, to stay healthy, the body needs strong resistance and an effective immune system to protect against pathogens, especially infectious diseases, while also safeguarding internal cells.

Moreover, strong resistance is key to fighting diseases because the immune system can remember viruses, bacteria, etc., that it has previously eliminated. Thus, when these pathogens re-enter the body, the immune system can quickly recognize and eliminate them.

To enhance bodily resistance, individuals should focus on a full, scientific diet; engage in regular physical activities; ensure sufficient, timely sleep; and avoid smoking.

These activities play a crucial role in boosting the immune system, alongside genetic factors. Additionally, complete vaccination contributes to strengthening resistance, helping the body produce specific antibodies against future pathogens.

1.3. The Importance of Resistance Against Diseases

To combat common seasonal illnesses such as influenza, the common cold, throat infections, bronchitis, etc., the body produces antibodies against abnormal cells, known as strong resistance pushing back diseases. A person with strong resistance, implying a healthy immune system, can also combat severe diseases like cancer and cardiovascular diseases.

Eliminating bacteria or viruses requires a complex mechanism involving cells, tissues, and various organs. This natural defense line that each person possesses develops stronger with sports activities and proper nutrition. A healthy body means a strong immune system, effectively protecting against disease-causing agents. A strong immune system can also fight cancer and heart diseases.

The immune system is tasked with creating white blood cells along with proteins and chemicals to destroy invading pathogens. Before these pathogens can grow within the body, the immune system attempts to locate and eliminate them. Better resistance means a stronger immune system to accelerate this destruction process.

Besides blocking the entry of pathogens, strong resistance maintains the stability of cells and organs in the body; keeping the body in a healthy, balanced state with fewer minor illnesses and sharper mental clarity.

Good resistance also stimulates the body's natural recovery ability, helping it recover faster after illnesses. In children, resistance plays a crucial role in their growth and development, providing a solid foundation for comprehensive physical and intellectual development.

1.4. Causes of Decreased Immunity

From birth, everyone has inherent immunity, which varies based on lifestyle and nutrition. Several factors can either increase or decrease this immunity significantly:

Consumption of Processed Foods

These types of food (such as candies, chips, sodas, carbonated drinks, snacks, etc.) contain many substances harmful to health (sugar, salt, fats), weakening T and B cells. These cells are crucial in fighting diseases; therefore, their weakening leads to a significant decrease in immunity.

High Consumption of Food

Eating too much food or frequently consuming certain nutrients without diversifying the intake can affect the body: Proteins can boost the production of the IGF-1 hormone, which impedes the immune system and contributes to the body's aging; trans fats and saturated fats should be minimized, while fatty fish (like salmon and mackerel) or foods like kale and almonds should be consumed to provide healthy fats, thus boosting immunity.

Lack of Sleep

During deep sleep, the body produces melatonin. Staying up late affects the immune system, where white blood cells are not produced adequately to fight off pathogens. Thus, it is necessary for a person to get at least 8 hours of sleep daily.

Prolonged Mental Stress

A study from Carnegie Mellon University (USA) has shown that being in a state of prolonged stress can also weaken the immune system. Therefore, participating in community recreational activities is a way to relieve stress and indirectly enhance immune health.

Additionally, long-term stress can lead to an imbalance in endogenous hormone levels (male sex hormone testosterone, female sex hormone estrogen, etc.), weakening the immune system's ability to fight off bacteria.

Frequent Use of Cosmetics

The diversity in cosmetic products requires the skin to absorb many potentially harmful substances, such as sodium lauryl. Over time, this can adversely affect the immune system in the body: Primer; Concealer; Sunscreen; Foundation; Lipstick.

Limited Physical Activity

A decrease in immunity can also stem from an unexpected cause: limited physical activity. This restricts the metabolic process, leading to slow nutrient absorption, inevitably weakening the immune system and making one more susceptible to illnesses.

Environmental Pollution

Air pollution caused by vehicle exhaust, road dust, and carbon emissions from industrial areas contributes to weakened immunity. Fine dust particles entering the lungs and the cardiovascular system can cause: Pneumonia; Respiratory infections; Chronic obstructive pulmonary disease; Heart diseases; Stroke.

1.5. Signs of Decreased Immunity

When the body's immunity decreases, many warning signs such as poor digestion, physical weakness, frequent illness, and fatigue can manifest. A person may suffer from respiratory-related illnesses like asthma and allergies if their immune system is frequently weakened. Here are some signs of decreased immunity:

Frequent Fatigue

When immunity decreases, energy levels also drop, leading to prolonged fatigue and loss of vitality. This explains why one may feel exhausted despite getting enough sleep. This is because the body is focusing on supporting the immune system to combat invading bacteria and viruses.

Mental Exhaustion

Frequent illness and weakness due to stress or prolonged debilitation are the most noticeable mental signs in someone with weak immunity. According to a report by the American Psychological Association, the immune system functions less effectively against threats from bacteria, viruses, or other pathogens in people under prolonged stress, as lymphocyte cells (a type of white blood cell important for combating infections from bacteria, viruses, or fungi) are significantly reduced due to stress. The lower the lymphocyte levels, the higher the likelihood of illness.

Poor Digestive Function

In humans, the digestive tract contains 70% of the immune system structure. Studies show that the intestines are effectively protected by beneficial bacteria and microorganisms living in the gut. When infectious agents invade but the microorganisms cannot combat them, the body is more prone to digestive diseases. Thus, frequent bloating, diarrhea, or constipation may be warning signs of weakened immunity.

Prolonged Cold

Every time the weather changes, it creates favorable conditions for bacteria and viruses to invade the body, causing one to suffer from a cold for several days (sneezing, runny nose, congestion). This is normal and usually resolves within 1 to 1.5 weeks as the immune system produces antibodies to destroy the pathogens. However, if the condition of the cold or flu persists without recovery, it is a sign of problematic immunity, significantly weakened.

Slower Wound Healing

Whenever injured, such as cuts or scrapes, the body initiates a damage control mode and new skin regeneration by mobilizing blood and nutrients to the wound. The healthier the immune

cells, the faster the recovery; conversely, if the immune system is weak, the recovery time is longer and healing is more difficult.

Susceptibility to Infections

If a person has chronic sinusitis or three acute sinusitis episodes due to bacteria within a year; more than two upper and lower respiratory tract infections per year; treated with antibiotics more than twice a year, etc., it is likely that their immune system is weakening. Signs of decreased immunity might include prolonged fatigue and poor digestive function.

1.6. Impact of Decreased Immunity

Strong immunity plays a very important role for everyone in effectively protecting their health. Therefore, any reason that causes a decrease in immunity (or immune deficiency) must confront unpredictable and very dangerous risks.

Therefore, one should strengthen their immunity by changing previous unhealthy lifestyle habits, regularly playing sports, getting enough sleep, and supplementing with vitamins and minerals; avoiding stimulants, alcohol, and tobacco.

Some effective ways to enhance immunity

In any situation, pathogens carrying the risk of causing disease can attack a person and cause illness if their immunity is not strong enough to fight back. Therefore, besides having a healthy genetic system, it is also necessary to have good habits to strengthen immunity more effectively.

Adequate Rest

An adult also needs sufficient and good quality sleep, ideally 8 hours or more, or at least 6 hours each night. With insufficient sleep, the body is more likely to get infected by bacteria and viruses. To improve sleep quality, consider drinking herbal tea before bedtime and maintaining gentle lighting in the bedroom.

Healthy Eating and Vitamin Supplementation

Nutrition plays an important role in boosting immunity and maintaining a good immune system. Therefore, it is necessary to regularly include vegetables, fruits, nuts, fatty fish, and whole grain products in the diet. Additionally, daily vitamins to supplement may include Omega 3, Vitamin C, Vitamin B12, Vitamin D3.

Clean Hygiene

Develop the habit of washing hands with soap before eating and after using the restroom. A person may inadvertently touch their eyes or lips after coming into contact with bacteria. Thus, if hands are not washed frequently, bacteria can enter the body.

Exercise

Regular physical activity has always been a way to effectively boost the immune system, a fact proven by various scientific researchers. Regular exercise not only improves physical health but also contributes to better mental well-being.

Complete Vaccination

Vaccination is the most effective method to improve immunity and enhance the immune system's response. When a vaccine enters the body, it stimulates the production of specific natural antibodies against corresponding pathogens, thus preparing the body to cope with similar pathogens in the future.

1.2. Your Immune System

The immune system, formed by a complex network of organs, cells, tissues of the lymphatic system, and large molecules, operates in unison as a defense line to protect the body from dangerous pathogens such as viruses, bacteria, fungi, parasites, allergens, cancerous cells, and to actively create antibodies to prevent reinfection, thereby maintaining human health. The immune

system in the body is divided into two main types: active immunity and passive immunity, each with different characteristics, activation methods, and maintenance, but both operate with the purpose of protecting the body from the invasion and attack of pathogens. Specifically:

Table 1: Active Immunity and Passive Immunity

Active Immunity	Passive Immunity
<p>Active immunity is developed when the body comes into contact with a pathogen, at which point the immune system is immediately activated to produce appropriate antibodies against the foreign agent. Active immunity often lasts long and can be lifelong.</p>	<p>Passive immunity is a type of immunity where instead of the body producing antibodies, they are passively supplied from an external source. Newborns have an immature immune system but are capable of resisting pathogens due to the passive antibodies transmitted from the mother during pregnancy. Additionally, humans can also receive passive antibodies through the administration of immune serum (Immune Globulin).</p>
<p>Active antibodies are produced in two ways: naturally when the body comes into contact with a pathogen, and when the body encounters a weakened or inactivated pathogen that no longer has the capacity to cause disease through vaccination.</p>	<p>If active immunity takes time to develop, passive immunity can protect the body immediately, however, this antibody level only lasts for a few weeks or months.</p>
<p>Regardless of how active antibodies are produced, if the body already has immunity, should it unfortunately come into contact with the disease in the future, the immune system will be immediately activated to produce appropriate antibodies against the pathogen.</p>	

According to research, the immune system tends to decline with age, due to the use of immunosuppressive drugs, and individuals with cancer, HIV/AIDS, or immune function disorders are more susceptible to pathogen attacks because the immune system requires more time to respond to pathogens.

Therefore, to maintain a healthy immune system, the best thing each person can do is to take good care of their health, eat a balanced diet to ensure proper nutrition, engage in regular physical exercise, and actively get vaccinated to prevent dangerous infectious diseases.

The immune system helps the body resist the attacks of bacteria, viruses, fungi, parasites, allergens, cancerous cells, and actively creates antibodies to prevent reinfection.

1.3. Boosting Your Immune System

1.3.1. Vaccination to Enhance Immunity

One of the most effective and long-lasting ways to enhance the immune system is through active vaccination. Vaccines are a monumental medical achievement that contain antigens (either live attenuated or inactivated pathogens that no longer have the ability to cause disease). After vaccination, the immune system detects these foreign antigens and responds by producing suitable antibodies to protect the body, mimicking the actual infection process.

When viruses or bacteria attack again, the immune system, having remembered how to respond, quickly forms a defensive barrier against these foreign agents, effectively preventing disease and minimizing potential harm to humans.

1.3.2. Need for a Scientific Diet

The role of a scientific diet as a way to boost the immune system has been proven in practice. By establishing and maintaining a balanced and healthy diet, rich in various food types to provide all necessary nutrients, the body's resistance can be maintained and strengthened. If illness does occur, a healthy immune system also accelerates the recovery process.

Vegetables and Fruits

Adding fiber-rich foods such as fruits and vegetables is highly recommended to enhance the immune system because these foods contain numerous nutrients, vitamins, essential minerals, and antioxidants that help fortify a robust immune system and combat dangerous pathogens.

Antioxidants in certain fruits and vegetables, such as citrus fruits, red bell peppers, broccoli, garlic, ginger, green tea, spinach, almonds, turmeric, and papaya, help reduce inflammation effectively by combating free radicals that can cause inflammation if accumulated in high doses in the body.

Fiber plays a crucial role in nourishing the microbiome and beneficial bacteria in the gut. A healthy gut microbiome positively impacts the immune system by promptly responding to foreign agents entering the body through the digestive system, thereby enhancing resistance and ensuring optimal body protection.

Some studies have shown that beneficial bacteria, Probiotics, are closely linked to the brain in actively controlling neurological disorders such as depression, autism, and anxiety disorders.

Vitamin C found in fruits and vegetables has been proven to support the production of important proteins that improve and are an effective way to boost the immune system. Additionally, Vitamin C is an antioxidant, protecting the body from various negative impacts of free radicals, pollutants, and toxins, thereby strengthening the immune system and enhancing body resistance.

Fermented Foods (Probiotic)

Increasing antibody strength by boosting beneficial Probiotic bacteria in the gut is an effective way to enhance the immune system. The gut is structured like a diverse microbial network consisting of 85% beneficial bacteria and 15% harmful bacteria. Beneficial bacteria play a crucial role in enhancing human health by synthesizing vitamins, preventing infections, aiding digestion, and absorbing essential nutrients, thus boosting the body's immune system.

Beneficial bacteria such as Lactobacilli, Bifidobacteria, *Bacillus clausii*, Lactobacilli, and Bifidobacteria are important in creating a robust defense wall to protect the gut and promote immune response. The strains Lactobacilli and Bifidobacteria are the most common and effective in preventing and blocking diseases related to the respiratory system. Research from the Japanese Pediatric Association indicates that consuming probiotic-rich foods twice a day can significantly reduce the risk of symptoms such as fever, cough, and runny nose in children aged 8 to 13.

Other studies also show that these two strains produce lactic acid and acetic acid, reducing the pH level in the intestines and simultaneously preventing the growth of harmful bacteria. Therefore, experts recommend including common fermented foods like yogurt, pickled cabbage, kimchi, kefir, and fermented soybeans in daily meals to enhance human immune response.

High-Quality Protein

To effectively boost the immune system, the body needs to be supplemented with high-quality protein. This component is extremely important for constructing body tissues, antibodies, synthesizing red and white blood cells, hormones, and maintaining a healthy immune system,

and speeding up the wound healing process. Some food sources high in quality protein include tuna, lean beef, chicken breast, seafood, eggs, milk and dairy products, and nuts, which are recommended to be included in the daily nutritional menu.

Healthy Fats

Healthy fats found in salmon, olive oil, and chia seeds play a significant role in supporting the body in reducing inflammation if an immune response to disease agents occurs.

A scientific study published in the academic journal *Frontiers in Immunology* reports that Vitamin D3, found in high amounts in salmon and other animal sources, helps activate genes closely related to a group of natural proteins – an important factor in protecting the body from dangerous disease agents. Olive oil, with its high anti-inflammatory properties, helps combat bacteria and viruses causing disease and reduces the risk of chronic diseases related to cardiovascular and type 2 diabetes.

Including healthy fats found abundantly in salmon, olive oil, and chia seeds is an effective way to boost the immune system.

Whole Grains

Choosing whole grains in daily meals will improve health in many ways. The vitamins and minerals in these foods have the ability to control blood pressure, weight, and cholesterol levels (reducing bad cholesterol and increasing good cholesterol), thereby reducing cardiovascular diseases, diabetes, and other dangerous diseases.

Low Sugar Intake

Studies show that a daily diet high in sugar and processed refined carbs like pasta, bread, fried potatoes, donuts, and energy drinks can lead to overweight, obesity, and increase the risk of chronic dangerous diseases such as high blood pressure, coronary artery disease, heart failure, stroke, diabetes, fatty liver disease, cirrhosis, joint diseases, and cancer.

Therefore, experts specifically advise everyone to appropriately reduce sugar intake in their daily diet and increase physical exercise to control weight and prevent dangerous diseases that directly threaten life.

The American Heart Association (AHA) advises that children, men, women, and individuals with underlying health conditions should consume different amounts of sugar each month. Specifically:

Target Group	Recommended Sugar Intake per Month
Children aged 2 to 18 years	Less than 750g/month
Adult Women	750g of sugar/month
Adult Men	1.08kg of sugar/month
Diabetic Patients	Less sugar than the normal recommendation. Excessive sugar intake in diabetics can lead to serious complications such as ketoacidosis – an acidic blood condition, kidney disease, cardiovascular issues, high blood pressure, macular edema, and cataracts.

To best enhance immunity, it is advised to limit high-sugar foods in daily meals.

- **Drinking Enough Water**

Water plays a crucial role in maintaining health. The body needs sufficient water to ensure continuous blood circulation and adequate oxygen supply to all vital cells and organs. When

cells and organs are well-nourished, they function more efficiently, thereby strengthening and solidifying the immune system. Moreover, water is essential for the kidneys to eliminate toxins from the body. Insufficient water intake leads to reduced oxygen in the blood, preventing it from reaching the kidneys, which causes toxins to accumulate over time and weaken the immune system. The immune system requires adequate hydration to help eliminate toxins from the body.

1.3.3. Adequate and Quality Sleep Enhances the Immune System

What Constitutes Quality Sleep?

The relationship between sleep and the immune system is well-established. Quality sleep enhances the efficiency of T lymphocyte cells (commonly known as T cells), a type of white blood cell crucial for the body's immune system to fight against dangerous pathogens or any foreign antigens that invade the body. During sleep, immune cells recognize these "foreign invaders" and respond by releasing a type of protein **called**Integrin. Integrin helps T cells adhere tightly to foreign antigens and ultimately destroy them. Therefore, quality sleep boosts the effectiveness of T cells and naturally strengthens the immune system, enabling the body to better resist diseases.

• **Recommended Sleep Duration by Age from the National Sleep Foundation:**

Age Group	Recommended Sleep Duration per Day
0 to 3 months	14 to 17 hours/day
4 to 11 months	12 to 15 hours/day
1 to 2 years	11 to 14 hours/day
3 to 5 years	10 to 13 hours/day
6 to 13 years	9 to 11 hours/day
14 to 17 years	8 to 10 hours/day
18 to 64 years	7 to 9 hours/day
65 years and older	7 to 8 hours/day

How to sleep well?

To achieve a good night's sleep, one can apply the following scientific methods to improve both the quality and duration of sleep:

- Establish and adhere to a regular daily schedule: Go to bed and wake up at the same time every day, even on weekends or while traveling.
- Before going to sleep, develop a few good relaxation habits such as reading books, listening to soft instrumental music, soaking your feet, or taking a warm bath. Minimize the use of electronic devices like TVs, computers, and phones at this time.
- Keep the bedroom temperature comfortable, use dim lighting, and ensure the sleeping environment is quiet.
- Exercise regularly every day, but avoid exercising within 3 hours before bedtime.
- Avoid consuming heavy foods such as breads, pastries, candies, deep-fried foods, fast food, and especially avoid drinks containing a lot of caffeine like tea, coffee, and soda, as

they can interfere with the action of adenosine, a natural chemical that induces sleepiness at night.

- Avoid stimulants before bedtime such as smoking, and drinking alcohol or other alcoholic beverages as they can cause insomnia and restlessness.

Quality sleep enhances the effectiveness of T cells and is a way to naturally boost the immune system, allowing the body to better resist diseases.

1.3.4. Enhancing Physical Activity

Exercise

One of the recommended ways to effectively boost the immune system is to increase physical activity. Exercising increases circulation, makes the heart beat stronger and faster to ensure blood is regularly pumped to the organs, consumes energy, enhances the body's endurance, and activates the excretory system to eliminate excess substances from the body.

Moreover, exercise helps the brain release endorphins, which reduce pain, combat anxiety, stress, and stimulate the immune system to effectively combat pathogens.

To maximize the effectiveness of exercise, choose a sport suitable for one's physical condition and preferences with a reasonable intensity, balancing activity and rest, and avoid overexertion as it can lead to undesirable outcomes like dislocations, sprains, or muscle damage.

1.3.5. Enhancing Mental Health and Managing Stress

According to research from the University of Kentucky (USA), enhancing mental health and managing stress not only makes life more enjoyable but is also an effective way to boost the immune system, helping to prevent diseases and prolong life. When mental health is enhanced, the immune system is strengthened, and immune cells respond more quickly and effectively to foreign agents attacking the body. Conversely, when optimism decreases and stress and worry are frequent, the immune system also weakens.

1.3.6. Maintaining a Healthy Weight

Building and maintaining a scientific, healthy, and nutritious diet contributes to maintaining weight, thereby minimizing cardiovascular diseases and improving overall health.

1.3.7. Preserving an Ideal Living Environment

Exposure to Sunlight

One of the significant benefits of sun exposure (sunbathing in the early morning) is helping to convert pre-vitamin D under the skin into the vitamin D necessary for the body to grow healthy, reduce blood cholesterol, and address cardiovascular and diabetes-related issues. Regular sunbathing also accelerates the production of T cells, helping to eliminate various viruses and bacteria.

Lack of vitamin D can lead to severe health damage such as muscle pain, muscle weakness, bone pain, high blood pressure, stroke. Pregnant women lacking vitamin D risk developing osteomalacia, leading to rickets and related bone damage in newborns.

Clean Water Source

Statistics from the Ministry of Health indicate that polluted water sources are one of the causes related to dangerous infectious diseases such as acute diarrhea, cholera, typhoid, gastrointestinal diseases, conjunctivitis, hepatitis A, encephalitis, cancer, due to the high content of parasites, microorganisms, heavy metals, toxic organic substances that severely affect human health.

Therefore, to minimize the health impacts of polluted water sources, every family needs to protect clean water sources from small actions like minimizing plastic waste, not pouring cooking oil directly into the sink, not using pesticides, regularly cleaning up waste, and needing

water source treatment measures, renovating water pipes, cleaning storage tanks to ensure a clean water source for the family, minimizing the risk of dangerous infectious diseases.

Clean Air

Air pollution is also an environmental factor that significantly impacts human health, weakening and devastating the immune system. 2016 statistics estimate approximately 6.5 million premature deaths due to indoor and outdoor air pollution worldwide.

Anyone is at risk of severe consequences due to deteriorating air quality, causing an imbalance in oxidation (considered very important for the immune system); when the immune system is weakened, it cannot fight infections such as the flu, acute respiratory infections, pneumonia, lung cancer, diarrhea,...

Therefore, to minimize the impact of air pollution, each individual needs to regularly clean the living space, wipe every nook and cranny in the house, vacuum regularly, plant many green plants around to help clean the air, and invest in air purifiers to filter the air, capable of removing fine dust, allergens,...

Avoid gatherings in polluted areas, and supplement plenty of vegetables, fruits, foods rich in antioxidants to prevent the formation of free radicals from air pollution and effectively boost resistance.

1.3.8. Maintaining Good Daily Habits

Regular Hand Washing

Forming the habit of washing hands with soap to proactively prevent dangerous infectious diseases. Research shows that human hands contain up to 4.6 million bacteria because during daily activities they frequently contact many people, handle many objects leading to a large accumulation of bacteria on the hands. If a person accidentally touches their face, eyes, nose, mouth, it will create conditions for bacteria, viruses causing diseases to invade and attack the body.

The United States Centers for Disease Control and Prevention (CDC) states that clean hand washing helps reduce up to 40% of cases of acute diarrhea, nearly 60% of cases of diarrhea in immunocompromised individuals, 20% of cases of respiratory diseases, and more than 50% of cases of children missing school due to gastrointestinal diseases.

Personal Hygiene

Regularly bathing and maintaining personal hygiene will also help the body eliminate bacteria, viruses, microorganisms causing diseases and invading the body.

Regularly Update Disease Information from the Media

Along with the above proactive methods to strengthen the immune system, each individual also needs to regularly update official information related to the disease situation from newspapers, television to understand the disease prevention measures recommended by the Ministry of Health and reputable experts.

Equip Yourself with Disease Prevention Knowledge

Given the rapid spread and serious complications of infectious diseases, equipping oneself with disease prevention knowledge is essential to proactively prevent diseases, detect diseases timely, thereby protecting the health of oneself, family, and the community.

1.3.9. Practice Regular Health Check-ups

Health is a priceless asset for each person and is the foundation for all beginnings, plans in life. Therefore, in addition to building a healthy, scientific nutrition regime, exercising, one of the proactive ways to enhance the immune system is to maintain the habit of regular health check-

ups to detect timely any unusual signs of the body, prevent risks, serious consequences due to diseases.

It is recommended to have a health check-up every 6 months to detect timely any unusual signs of the body, prevent risks due to diseases.

1.3.10. Quit Smoking (if applicable)

Limit and quit the habit of smoking. Because it is a cause that weakens the immune system and reduces the effectiveness of fighting diseases. Moreover, smoking frequently also causes serious damage to the lungs, making it easy to contract cardiovascular diseases, arthritis, type 2 diabetes, and a high risk of cancer,...

1.3.11. Avoid Alcohol (if applicable)

Similar to tobacco, alcohol and alcoholic beverages are also not beneficial for the immune system. The residual alcohol in the body acts as an immune system inhibitor, so people who drink a lot of alcohol are very susceptible to infections and increased inflammatory responses.

It is necessary to limit alcohol and alcoholic beverages because they cause the function of the immune system to increasingly decline.

1.3.12. Use Nutritional Supplements to Support the Immune System (Do Not Overuse)

Experts note that although nutritional supplements can be used to enhance the immune system due to a lack of nutrients in the daily diet, they should not be overused, and the best way is to supplement vitamins, minerals, and essential nutrients by adding them to daily meals. If nutritional supplements are needed, consult a doctor before use to achieve the best effect.

2. The Importance of Nutrition in Enhancing Immunity

Boosting the body's immunity means enhancing immune health, in which nutrition plays a particularly important role and can effectively improve immune health. Besides uncontrollable objective factors such as age, gender, genetics, and living environment, there are subjective factors like nutrition, lifestyle habits, and physical activity levels, among which nutrition plays a particularly prominent role.

If the immune system is considered a fortress, nutrition is the raw material that builds this fortress through various nutrients including proteins, lipids, and carbohydrates, which are the building blocks of the immune system components such as antibodies, cytokines, and receptors.

Moreover, vitamins and minerals are crucial links and signaling substances that keep the barrier strongly connected. Furthermore, nutrition also provides the energy needed for the immune system to operate smoothly, ready to be effectively activated when harmful agents intrude.

A balanced, scientific, and well-rounded diet not only provides the body with energy but is also key to enhancing resistance, helping to fight diseases and various pathogens.

Gut health and the immune system are closely linked, and changes in gut health can affect the immune system and vice versa.

Therefore, additional nutritional supplements such as probiotics, prebiotics that nourish gut bacteria, and natural antioxidants in the form of plant polyphenols through a diverse diet rich in fruits and vegetables also help maintain a healthy digestive system and long-term health protection.

Nutrition plays a very significant role in enhancing immunity and the body's resistance. When the immune system is strong, it helps the body fight diseases, including COVID-19 - a pandemic the world is currently facing and for which there is still no treatment protocol.

Some types of foods that help boost immunity for the body:

Plant-based Foods Whole plant-based foods like colorful fruits and vegetables, nuts, and beans are rich in nutrients and antioxidants that help protect the body against free radicals, which are molecules that can damage cells.

Antioxidants in these foods help reduce inflammation by fighting unstable compounds known as free radicals, which can cause inflammation when they accumulate in the body at high levels.

Chronic inflammation is linked to various health issues, including heart disease, Alzheimer's, and some cancers.

Meanwhile, the fiber in plant-based foods provides healthy bacteria in the gut. A healthy gut microbiome can improve immunity and help prevent harmful pathogens from entering the body through the digestive tract.

Eating plant-based foods helps boost resistance.

Healthy Fats Healthy fats, such as those found in olive oil and fatty fish rich in omega-3 fatty acids like salmon, tuna, and mackerel, can enhance the body's immune response to pathogens by reducing inflammation.

While low-level inflammation is a normal response to stress or injury, chronic inflammation can inhibit the immune system.

Olive oil, with its high anti-inflammatory properties, is linked to reducing the risk of chronic diseases such as heart disease and type 2 diabetes. Moreover, its anti-inflammatory properties can help the body fight harmful bacteria and viruses.

Omega-3 fatty acids in fatty fish and chia seeds also fight inflammation, beneficial for the immune system.

Fermented Foods Research shows that a robust gut bacterial network can help immune cells differentiate between normal, healthy cells and harmful invading organisms.

Fermented foods are rich in beneficial bacteria that are great for gut health. These foods are produced or transformed with the aid of microorganisms such as bacteria and yeast, such as yogurt, sauerkraut, and kimchi.

Foods Rich in Prebiotics Prebiotics selectively feed the bacteria related to a healthy gut when we consume them.

Prebiotics are found in foods like apples, artichokes, bananas, barley, oats, chia seeds, flaxseeds, garlic, onions, beans, and green and black teas.

Water Staying hydrated may not protect you from germs and viruses, but dehydration can harm your health. Dehydration can cause headaches and hinder physical activity, concentration, mood, digestion, and heart and kidney function.

To prevent dehydration, we should drink sufficient water daily, about 2 liters for an adult, from calorie-free, additive-free, and sugar-free sources. In cases of high-intensity exercise or working outdoors in hot weather, you need to drink more water.

For the elderly, it's important to note that they start to lose their sense of thirst, so they need to drink water regularly even when not feeling thirsty.

Role of Nutrients for the Immune System The human body's immune system detects foreign antigens that enter and reacts to them quickly. In case pathogens invade the body, the immune system activates and generates an immune response.

Many factors affect the function of the immune system, including nutrition. Micronutrients participate in almost all metabolic processes and development occurring in the body, including energy production, cell division, replication, growth, maintenance, and function of the brain, heart, immune system, lungs, skin, bones, muscles, etc. Micronutrients also maintain the balance of the internal environment, helping damaged cells and tissues to recover. Because the role of

micronutrients is related to all body functions, it's not hard to understand that chronic nutritional deficiencies are a major cause affecting the immune system and everyone's health.

Malnutrition, especially in childhood, plays a critical role in the occurrence of infectious diseases and mortality. Balanced, adequate nutrition helps enhance resistance, keeping the immune system strong against pathogens.

Immunity-boosting nutrients include protein, vitamins A, C, D, E, selenium, iron, zinc, flavonoids, omega-3, probiotics, etc.

Protein (protein): To enhance immunity, the body needs to be supplemented with a high amount of protein. This component is part of the tissues that make up the body, antibodies, red blood cells, hormones, etc. Thus, it plays a pivotal role in constituting the immune system. Protein sources include animal sources like fish, meat, seafood, eggs, milk, and plant sources like mushrooms, tofu, beans, nuts, etc.

Vitamin A and β -carotene: These two components are important in maintaining the integrity of the respiratory and digestive tract linings. Some foods rich in vitamin A and β -carotene include animal liver, egg yolks, papaya, carrots, sweet potatoes, pumpkins, oranges, mangoes, gac, broccoli, spinach, etc.

Vitamin C: Helps enhance the immune system by increasing iron absorption, participating in connective tissue construction, and antioxidation. This nutrient is involved in the metabolism and synthesis of certain substances such as catecholamines, adrenal cortex hormones, increases the production of interferon, helping to enhance the body's resistance. Lack of vitamin C increases the risk of decreased resistance and susceptibility to infection. Vitamin C is abundant in many fresh fruits and vegetables like cherries, guava, oranges, tangerines, grapefruits, papaya, mango, apples, grapes, kiwis, tomatoes, broccoli, beets, green vegetables, bell peppers, spinach, etc.

Vitamin E: The body will enhance immune capacity when it has an adequate amount of vitamin E. This nutrient acts as an antioxidant, protecting vitamin A and cell membrane fats from oxidation, participating in cell metabolism, and increasing body resistance. Vitamin E is abundant in various seeds: sunflower seeds/sunflower oil, olive/olive oil, soybeans/sprouts, sesame, peanuts, wheat, dark green vegetables like sprouts, spinach, etc.

Vitamin D: According to research, vitamin D is related to various functions of the immune system such as digestion, circulation, and nerves.

Vitamin D is primarily synthesized in the skin under the effect of sunlight (about 80%) and partially from the diet (about 20%). Each day, you should be exposed to early morning sunlight for 15-30 minutes, while also increasing the use of foods rich in vitamin D like fish liver oil/fish liver oil, egg yolks, fish, seafood, and vitamin D fortified foods (milk, cereals)...

B Vitamins: B vitamins participate in metabolic processes, synthesizing cells involved in immune mechanisms. Immunity-enhancing foods rich in B vitamins include rice bran, cereals, various beans, sesame, wheat germ, etc.

Selenium: This is a strong antioxidant that helps enhance the body's ability to fight infections, participates in activating some enzymes in the immune system, and detoxification. Selenium is abundant in brown rice, germinated rice, fish, shrimp, seaweed...

Iron: Necessary for DNA synthesis and cell division. Additionally, this nutrient participates in the blood-making process. Iron is abundant in red meat, egg yolks, liver, other animal proteins, and some plant-based foods like black mushrooms, shiitake mushrooms, red amaranth, soybeans...

Zinc: Helps enhance immunity, helps wounds heal faster, maintains taste and smell. This substance participates in hundreds of metabolic enzymes in the body, helping to maintain the

normal operation of the immune system. You can supplement zinc through foods such as meat, fish, seafood, especially shellfish like oysters, crabs, clams...

Omega 3: This is an essential fatty acid that the body cannot synthesize, playing an important role in anti-inflammation and improving the immune system. Immunity-enhancing foods rich in omega 3 include fish oil, mackerel, salmon, basa, bonito, anchovies, tuna, oysters, and some seeds...

Flavonoids: Flavonoids also play an important role in enhancing antioxidant capacity, found in many herbs such as mint, perilla, broccoli, green cabbage, apples, green tea, ginger, garlic, turmeric, dark green vegetables.

Probiotics (probiotics): These are live microorganisms beneficial to the immune system, found in yogurt, some cheeses, fermented soybeans (miso, natto)...

Nutrition cannot replace the effectiveness of any medication and cannot prevent other diseases from attacking the body. However, maintaining a strong immune system is something all healthy individuals can do.

Additionally, factors such as stress management, avoiding the use of tobacco, alcohol, and stimulants, and regular exercise are among the measures to enhance the immune system. Cultivating a healthy lifestyle with a nutritious diet, regular exercise, and sufficient sleep is the best way to enhance immune capability.

3. The Importance of the Immune System

The immune system (IS) is a network of specialized cells, proteins, tissues, and organs that helps protect the body against harmful bacteria and microorganisms. One of the crucial cells of the IS are the white blood cells, which act like warriors fighting against harmful foreign invaders, such as the coronavirus, which is currently of global concern. Unlike other systems in the body, the IS has a complex structure that "covers" the entire body to keep people healthy.

For this reason, the IS is likened to a natural defense system through the immune response (IR) mechanism. IR occurs in three basic steps: first, it creates a barrier to prevent the entry of pathogens or foreign antigens (when the body is healthy). Second, when pathogens breach this barrier, the IS continues to produce white blood cells, as well as other chemicals and proteins to attack and destroy the harmful foreign elements. It seeks and destroys antigens before they can multiply (in the sick). Third, if unsuccessful, the IS will ramp up its power to hold the pathogens in place to prevent their spread.

A good, efficiently functioning immune system means the body does not succumb to diseases, including dangerous ones like cancer, cardiovascular diseases, or new and unusual viruses, and it creates antibodies to prevent the recurrence of old diseases. Conversely, if weakened, especially losing the ability to distinguish between external antigens and self-antigens, it can lead to autoimmune diseases such as diabetes, rheumatoid arthritis, psoriasis, lupus, or thyroid diseases...

Scientifically, viruses and bacteria are two different entities. Bacteria are microorganisms that can exist and grow independently outside the host, while viruses exist inside the living cells of another organism. Therefore, antibiotics can only treat bacteria and are ineffective against viruses. Sometimes, in treating viruses, the patient's immune system may weaken and become susceptible to bacterial cross-infection, so treatment may involve antibiotics, but they should not be used indiscriminately. Therefore, the contingency method is isolation, and treating symptoms means that prevention, boosting resistance, and waiting for the body's immune system to naturally destroy the virus are critical. Particularly, individuals with a history of lung diseases,

cancer, chronic diseases, or those with weak immune systems should avoid contact with disease sources.

To maintain a healthy immune system, everyone should maintain a healthy lifestyle and a scientific, balanced, and nutritious diet, focusing on beneficial foods. Additionally, there is a new direction, enhancing resistance with probiotics, which has been proven effective and easy to implement, especially reducing the rate of respiratory and digestive tract infections.

Probiotics, or beneficial bacteria, are a group of various bacteria beneficial for the survival and development of many other species, due to their natural symbiotic living mode, often found in the digestive systems of many species. More precisely, they are nutritional supplements containing beneficial bacteria or fungi. According to the definition by the FAO or WHO (World Health Organization), probiotics are live microorganisms that, when administered in adequate amounts, confer a health benefit on the host. This is a new direction in modern food processing in the world currently and in the near future.

In the gut, probiotics break down food ingested to provide an energy source for the cells in the intestines, found in foods and also in supplements (probiotics can be natural or added during processing). These foods include yogurt, yogurt drinks, fermented and unfermented milk, fermented soybeans, and some fruit juices, soy beverages. However, according to research, probiotics after being supplemented into the body are better in live form, and safer for users. According to WHO, the adequate dose for each probiotic supplementation, depending on an individual's constitution, can be 10⁸ units or 100 million units of beneficial bacterial cells, this dose can be increased to 10¹¹, with the condition that the bacteria must be isolated to the "strain" level.

Research on the benefits of probiotics is very promising. First, they are good for digestion, including treating constipation, diarrhea, colon cancer, colitis, and *H. pylori* infections. Some probiotic strains can enhance immune health by altering the gut microbiome and enhancing the immune system's response to help reduce illness.

Research on elderly individuals has also shown that the duration of all diseases is significantly lower in the group using a type of probiotics found in fermented milk. Specifically, it reduced the duration of winter infections (digestive and respiratory tract infections) by 20%.

One familiar product is yogurt containing two types of probiotics, lactobacillus and bifidobacterium, which can improve drug treatment, prevent *H. pylori*. This bacterium can cause infections in the stomach and upper part of the small intestine. It can lead to ulcers and may also increase the risk of developing stomach cancer. Therefore, supplementing beneficial bacteria by regularly consuming probiotic-containing foods like fermented food groups, especially yogurt, is very beneficial for health.

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