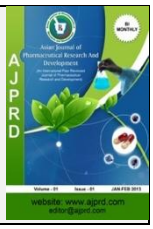
Available online on 15.06.2021 at http://ajprd.com

Asian Journal of Pharmaceutical Research and Development

Open Access to Pharmaceutical and Medical Research



Open Access

Review Article

Nutrition, Lifestyle & Immunity: Maintaining Optimal Immune Function & Boost Our Immunity

Ankita P. Patil*, Tejaswini M. Patil, Asavari R. Shinde, Rohan R. Vakhariya, S. K. Mohite, C. S. Magdum

Rajarambapu College of Pharmacy, Kasegaon, Dist. Sangli, Maharashtra, India.

A B S T R A C T

In the wake of the Covid-19 pandemic, people are increasingly becoming aware of the importance of good hygiene, healthy food for ensuring optimal immune function to keep viral/ other infections (communicable diseases) at bay. Immunity is the ability of body to resist a particular infection or toxin by the action of specific antibodies or sensitized white blood cells. The immune system is very complex. It is made up of several types of cells and proteins that have different jobs to do in fighting against foreign invaders. There are two types of immunity, innate immunity, acquired immunity. There are many different ways to boost immune system which include foods, medicines, nutraceuticals, vitamins, supplements, minerals, vaccine etc. Immunity is affected by different factors including age, gender, sleep cycle, stress, foods, exercise, genetic factors etc. Women have stronger immune response than men and hence they are more susceptible to autoimmune disorders like rheumatoid arthritis, IBD. Some environmental factors are also affecting the immunity. Person with weak immune system is more susceptible to various infections leads to various disorders.

Keywords: Good hygiene, immunity, antibodies, nutraceuticals, autoimmune disorders.

A R T I C L E I N F O: Received 26 Feb. 2021; Review Complete; 07 April 2021 Accepted; 30 May 2021 Available online 15 June. 2021

Cite this article as:

Patil AP, Patil TM, Shinde AR, Vakhariya R R, Mohite SK, Magdum CS, Nutrition, Lifestyle & Immunity: Maintaining Optimal Immune Function & Boost Our Immunity, Asian Journal of Pharmaceutical Research and Development. 2021; 9(3):129-136.

DOI: http://dx.doi.org/10.22270/ajprd.v9i3.970

***Address for Correspondence:**

Ankita P. Patil, Rajarambapu College of Pharmacy, Kasegaon, Dist. Sangli, Maharashtra, India.

INTRODUCTION:

Basic Introduction of Immunity and Immunity Boosters:

In biology, immunity is the capability of multicellular organisms to resist harmful microorganisms. Immunity involves both specific and nonspecific components. The nonspecific components act as barriers or eliminators of a wide range of pathogens irrespective of their antigenic make-up. Other components of the immune system adapt themselves to each new disease encountered and can generate pathogen-specific immunity.[1] Innumerable microorganisms such as bacteria, virus, fungi and protozoa are present all around us. These are present in the air we breathe, the water we drinkand in the food we eat. Many of these microbes can cause diseases, and are known as pathogens. Almost all living organisms have developed a defense mechanism that either prevents the entry of unwanted microbes into their body or destroys them upon entry. This defense mechanism of the body which helps to fight off unwanted invaders is known as immunity. In human beings, immunity is conferred by the immune system, which is made up of a complex network of cells, tissues, and proteins, which collectively defends our body against infections. The immune system has various roles in the protection of our body. It helps in the following ways:

1. It acts as a barrier, preventing the entry of unwanted foreign entities.
2. It helps the body in recognizing 'self' (body's own cell, tissue, protein, nucleic acid, etc.) from 'non-self' (cell, proteins, nucleic acid, etc. from the invading germs).
3. It mounts an immune response to deactivate or eliminate germs altogether.
4. It helps to clear up the body's own malfunctioning,

infected or dead cells.[2]

5. Immunity is the main mechanism of host defense against infectious agents, demonstrated by the enormous success of vaccination in eradicating disease. The concept that vaccines are the most effective means of preventing infection is well-recognized, both by public health authorities and by the public. Daniel Davis wrote, "The public are fascinated by the connections between lifestyle choices and immunity because there may be practical implications for what it takes to be healthy". There is, in particular, a public interest on increasing immune defense easily. Probably, the most popular belief is about the use of vitamin C to prevent infection, an idea that became popular after a series of scientific articles by Linus Pauling, who advocated the intake of larger amounts than those recommended at the time. The popularity, among lay persons, of this concept is such that "Improving the body's immune system" is the top reason for consuming nutritional supplements. The "immune boosters" market includes vitamins, minerals, antioxidants, probiotics, and "functional foods" as well as other complementary and alternative medicine (CAM) approaches.[3]

Types of Immunity:

Depending on how your body's immunity has developed, it can be classified as 3 components. This is the second line of defense which fights pathogens once they have entered the body. This includes mechanisms like fever, inflammation and phagocytosis (a process by which macrophages and natural killer cells of our body engulf the germs and kill them).

Adaptive (Acquired) Immunity: If the pathogens successfully evade the innate immune system, the next level of immunity that comes into action is the adaptive or acquired immune system. As the name suggests, adaptive immunity develops as we encounter exposure to pathogens throughout our life. The adaptive immune system is specific, i.e. it targets a specific pathogen and takes some time to develop. It also provides long-term immunity from the specific pathogen, through immunological memory. The adaptive immune system can be active or passive, natural or artificial. Let us break down the different types of acquired immunity.

Active Acquired Immunity: Due to the exposure to pathogens, your body develops B-cells and T-cells. These cells clear the existing germs through humoral immunity (antibody) or cell mediated immunity. Additionally, they also form memory B-cells and T-cells that can quickly respond to future infections. Active acquired immunity can be natural or artificial.

Natural: When a person has been naturally exposed to the pathogen due to infection, antibodies are produced that fight off the pathogen. Memory cells are formed to mount a quicker response in case of re-infection.

Artificial: When the infection is created artificially in a controlled manner, the acquired immunity is known to be artificial in nature. This is seen in the case of vaccination. During vaccination, a dead or inactivated germ, its proteins (antigens) or toxins are injected into the body. This practice does not cause serious infection or disease, but enables the body to develop appropriate antibodies against the pathogen. Memory cells are also formed. So, if the active (virulent) germ attacks in the future, the body has antibodies ready to fight it off.

Passive Acquired Immunity: When readymade antibodies are provided to the body to fight off a particular infection, it is known as passive acquired immunity. This gives immediate protection from an infection. It is usually given to high-risk patients or to patients with immunodeficiency (cannot make their own antibodies). However, as there is no exposure to the germ, the body does not develop immunological memory. This protection is usually short-term and the body cannot defend future infections from the same pathogen. Passive immunity can also be natural or artificial.

Natural: In natural passive immunity, certain antibodies from the mother's body reach the fetus through the placenta. Other antibodies are passed on to the child through breast milk. These antibodies provide protection to the newborn while his or her own immune system is still developing. The antibodies passed on from a mother are known as maternal antibodies, and belong to IgG and IgA class of antibodies.

Artificial: Here, readymade antibodies, specific to the disease, are introduced into the vulnerable person's blood stream to defend against infection. These antibodies are acquired from a previously infected person, or are produced in another organism. Monoclonal antibodies produced using recombinant DNA technology (RDT) is also used for this kind of immunization. For example, readymade antibodies might be given to AIDS patients to help their body fight the viral infection, as the patient's own immune system is too weak to produce the same.[4]

Functions of the Immune System: The functions of the immune system can be divided into two systems: (1) Innate or nonspecific immunity, (2) Specific or adaptive immunity.

These interacting systems differ in terms of the timing and specificity of their responses. Innate immunity provides an immediate but relatively nonspecific response to contain pathogens at the site of entry into the body. Innate immune defenses include inflammatory and acute phase responses, as well as the anatomical and chemical barriers provided by the skin and mucous membranes. Specific immunity is characterized by antigen-specificity through T and B lymphocytes. It also exhibits immunological memory, where heightened responses occur upon subsequent exposure to the same antigen, but this is not an immediate response. Although specific immunity is more selective and adaptive than innate immunity, it is a slow and complex process that occurs over several days to weeks. Conversely, innate immunity provides an immediate front line response,

but it lacks memory and candamage healthy tissue due to its nonspecific nature.

1. Innate Immunity: Inflammation is a local response designed to limit pathogen invasion and tissue damage. Phagocytes such as macrophages and neutrophils play a central role in the inflammatory response. They recognize foreign invaders through nonspecific receptors that identify common features of pathogens. Because a large pool of phagocytic cells is readily available, inflammatory responses can be observed within 1-2 hours after infection. During this time, macrophages use several mechanisms to contain infection. First, they release toxic enzymes and ingest the invading cells. Activated macrophages also synthesize and release nitricoxide, a gas that interferes with the proliferation of bacteria and other pathogens.In addition, activated macrophages release substances called cytokines, which are chemical messengers secreted by one cell that communicate with other cells.

Cytokines act locally to facilitate the inflammatory response and to attract other immune cells that promote healing at the site of infection or injury. For example, neutrophils, which normally flow freely in the blood stream, are recruited out of the circulation to the site of infection by cytokines such as interleukin-1 (IL1) that are released by activated macrophages. A similar mechanism is used to recruit all leukocytes (white blood cells, including monocytes, granulocytes, and lymphocytes) to the site of infection or inflammation. Natural killer cells (NK cells) are nonspecific lymphocytes that specialize in destroying tumor cells and virus-infected cells. Although they lack specific antigen receptors, they are able to recognize and kill some abnormal cells. NK cells secrete performing, chemical bullets that blow holes in the pathogen's cell membrane allowing granzymes to enter the cell. Granzymes signal the target cellto commit suicide, a process known as apoptosis.

Acute Phase Response, Whereas inflammation begins as a local response designed to contain infection, a systemic reaction known as the acute phase response or sickness syndrome will occur if the infection spreads to other parts of the body. This response is triggered when high concentrations of inflammatory cytokines (e.g., tumor necrosis factor alpha, IL-1, and IL-6) enter thecirculation to initiate a series of physiological and behavioral changes that help fight infection and promote healing. The acute phase response involves the release of proteins by the liver that migrates to the site of infection. Interestingly, some of these acute phase proteins act like nonspecific antibodies that bind a broad range of pathogens. Other physiological changes include fever, increased slow wave sleep, and increased leukocyte production and circulation. Behavioral changes are also observed during the acute phase response, including decreased feeding, physical activity, exploration, social interaction, sexual activity, and aggression. Other psychological changes include increased pain sensitivity, depressed mood, and memory impairments.

2. Specific Immunity: T and B cells use antigen-specific receptors to recognize and destroy antigens. To recognize antigen, part of the antigen must be presented to T-cells by an antigen presenting cell (APC), such as macrophages and dendritic cells. After engulfing and processing the antigen, the APC displays specific parts of the antigen on its surface. The T-cell interacts with an antigenic site on the displayed piece of antigen. T-cells have receptors that allow them to recognize and bind to specific antigenic sites. Thus, a large repertoire of T-cell receptors must be produced to adequately cover the large range of pathogens that will be encountered over the life span. When a T-cell receptor recognizes an antigenic site, it triggers proliferation and differentiation processes which normally occur in the lymphoid tissues. The T-cell rapidly divides to yield an army of T-cells with antigen-specific receptors that perform different tasks. Two classes of T- cells, helper and cytotoxic T-cells, are distinguished by CD4+ and CD8+ molecules on their surface, respectively. Both types of T-cells act to contain intracellular pathogens, but they also perform distinct tasks. T-helper cells coordinate the immune response by assisting in antigen recognition and by secreting cytokines that activate of other T and B-cells to increase their numbers.

Cytotoxic T-cells are able to kill virus-infected cells or tumor cells and thus play a major role in antiviral and antitumor activity. Another class of T-cells, known as suppressive T -cells, can actively inhibit the actions of other T-cells through the secretion of suppressive cytokines. In the case of B-cells, they differentiate into plasma cells that secrete antibody. This process is normally triggered by antigen binding and helper T-cell activity. These plasma cells rapidly divide and secrete antibodies, immunoglobulin molecules that act as receptors for antigen. These are soluble molecules that circulate in the blood where they can inactive antigen through binding or mark it to be destroyed.

Thus far we have described the primary immune response that is initiatedwhen the immune system does not have prior experience with the antigen. During the primary response, a subset of lymphocytes differentiates into memoryT and B-cells and remains in circulation for many years to provide immunity from diseases. Upon exposure to the antigen, memory T and B cells respond quickly to eliminate the antigen, a process known as the secondary immune response.

Immunodeficiency Disorder-Types, Symptoms, Diagnosis:

What is an Immunodeficiency Disorder?

Immunodeficiency disorder prevents your body from foreign pathogens and infectious diseases. This type of disorder helps to catch viruses and bacterial infections.

There are two types of immunodeficiency disorders congenital or acquired. A congenital or primary is form birth. Acquired or secondary disorders you get later in life. Acquired disorder is more common than congenital disorder.

Immune system includes the following organs:

- Spleen

- Tonsils
- Bone marrow
- Lymph nodes

These organs produce and release lymphocytes. These are white blood cells classified as B cells and T cells. B and T cells fight invaders called antigens. B cells release antibodies against specific disease. T cells destroy foreign or abdominal cells.

Examples of antigens where B and T cells might need to fight:

- Bacteria
- Viruses
- Cancer cells
- Parasites

An immunodeficiency disorder disrupts your body's ability to defend itself against these antigens.

What are the Different Types of Immunodeficiency Disorders?

An immune deficiency disease occurs when the immune system is not working properly. If you have deficiency from birth or if there is genetic cause it is called primary immunodeficiency disease. There are more than 100 primary immunodeficiency disorders.

Examples of primary immunodeficiency disorders include:

- X-linked agammaglobulinemia (XLA)
- Common variable immunodeficiency (CVID)
- Severe combined immunodeficiency (SCID), which is known as alymphocytosis or "boy in a bubble" disease

Secondary immunodeficiency disorders happen when an outside source like a toxic chemical or infection attacks your body. The following can cause a secondary immunodeficiency disorder:

- Severe burns
- Chemotherapy
- Radiation
- Diabetes
- Malnutrition

Examples of secondary immunodeficiency disorders include:

- AIDS
- Cancers of the immune system, like leukemia
- Immune-complex diseases, like viral hepatitis
- Multiple myeloma (cancer of the plasma cells, which produce antibodies)

Signs of an Immunodeficiency Disorder:

Each disorder has unique and specific symptoms that can be chronic or frequent. These symptoms are like:

- Pink eye
- Sinus Infections
- Colds
- Diarrhea
- Pneumonia
- Yeast Infections

If these problems do not respond to treatment or you don't completely get better then visit to your doctor and take test for an immunodeficiency disorder.

How are Immune Disorders Diagnosed?

If your physician thinks you have immunodeficiency disorder, they will want to do the following:

- Ask you about your history of your medicines
- Perform a physical exam or tests.
- Determine your white blood cell count
- Determine your t cell count
- Determine your immunoglobulin levels

Response of immune system that can be tested by vaccines is called an antibody test. Your doctor will give you a vaccine. Then doctor will take sample of blood for testing of response to vaccine a few days or weeks after vaccination. If you do not have an immunodeficiency disorder, your immune system will automatically produce antibodies which are fight against infection or disease. But the blood test does not show antibodies then you have disorder.

How is Immunodeficiency Disorders Treated?

There are some specific conditions of treatment for each immunodeficiency disorder. For example, AIDS causes several infections. Physician will prescribe remedy for each infection and you may be given an antiretroviral to treat and HIV infection if appropriate. Antibiotics and immunoglobulin therapy are commonly used for treatment of immunodeficiency disorders. Also viral infections caused by immunodeficiency disorders treated by using other antiviral drugs like amantadine, acyclovir or drug called interferon. Doctor might order as bone marrow transplant if your body is not produces enough lymphocytes.[5]

Parts of the Immune System:

Immune system is made of up a complex collection of cells and organs. They all work together to protect you from germs and help you get better when you're sick. The main parts of the immune system are:

White Blood Cells: Serving as an army against harmful bacteria and viruses, white blood cells search for an attack and destroy germs to keep you healthy. White blood cells are the key part of the immune system. There are many white blood cell types in the immune system. Each cell type either circulates in the bloodstream and throughout the body or resides in a particular tissue, waiting to be called into action. Each cell type has a specific mission in your body's defense system. Each has a different way of recognizing a problem, communicating with other cells on the defense team and performing their function.

Lymph Nodes: These small glands filter and destroy germs so they can't spread to other parts of your body and make you sick. They also are part of your body's lymphatic system. Lymph nodes contain immune cells that analyze the foreign invader brought to it and then activate, replicate and send the specific lymphocytes, which are white blood cells,

to fight off that particular invader. You have hundreds of lymph nodes all over your body, including in your neck, armpits, and groin. Swollen, tender lymph nodes are a clue that your body is fighting an infection.

Spleen: Your spleen stores white blood cells that defend your body from foreign invaders. It also filters your blood, destroying old and damage red blood cells.

Tonsils and Adenoids: Because they are located in your throat and nasal passage, tonsils and adenoids can trap foreign invaders (for example, bacteria or viruses) as soon as they enter your body. They have immune cells that produce antibodies that protect you from foreign invaders that cause throat and lung infections.

Thymus: This small organ in your upper chest beneath your breast bone helps mature a certain type of white blood cell. The specific task of this cell is to learn to recognize and remember an invader so that an attack can be quickly mounted thenext time this invader is encountered.

Bone Marrow: Stem cells in the spongy center of your bones develop into red blood cells, plasma cells and a variety of white blood cells and other types of immune cells. Your bone marrow makes billions of new blood cells every day andreleases them into the bloodstream.

Skin, Mucous Membranes and Other First-line Defenses: Your skin is the first lineof defense in preventing and destroying germs before they enter your body. Skin produces oils and secretes other protective immune system cells. Mucous membranes line the respiratory, digestive, urinary and reproductive tracts. These membranes secrete mucus, which lubricates and moistens surfaces. Germs stick to mucus in the respiratory tract and then are moved out of the airways by hair- like structures called cilia. Tiny hairs in your nose catch germs. Enzymes found in sweat, tears, saliva and mucus membranes as well as secretions in the vagina all defend and destroy germs.

Stomach and Bowel: Stomach acid kills many bacteria soon after they enter the body. You also have beneficial (good) bacteria in your intestines that kill harmfulbacteria.[6]

Factors Affecting Immunity:

Multiple factors like stress, age, body composition or our lifestyle can affect the performance of our immune system and any deviation from the normal pattern can affect our immunity.

Innate & Adaptive Immunity: The innate immune system is the first defense mechanism that gets activated immediately when a pathogen enters the body. Its main aim is to limit the spread of the bacteria or virus in the body. Physical & chemical barriers such as skin, lining of the gastric & respiratory tracts, eyelashes, bile, stomach acid as well as tears are all part of the innate immunity. Our body also produces fighter cells orWhite Blood Cells (WBCs) to patrol & defend the human body. Have you ever noticed that you do not develop a disease again or the recovery time gets shorter if you have already had it before? The reason being, that your body has developed a memory response from the previous infection and has learnt its strategy to fight against the particular pathogen. This adaptive immune response due to the B-cells & T-cells in the body.

Stress: When we're stressed, the body produces stress hormone corticosteroid or cortisol which decreases the body's ability to fight against infections making you more susceptible. Too much of stress can also lead to binge-eating on unhealthysnacks or consumption of alcohol which can lead to nutritional deficiencies and weaken your immunity.

Age: Our immune system's capacity declines as we get older, especially above the age of 70 years due to decrease in functioning of T-cells as a result of the degeneration of the thymus gland in the body which is the main site for T-cell production.

Body Composition: Too much or too little body fat can lead to suppression of the immune system. Excess weight gain can put you at the risk of developing co-morbid conditions like type 2 diabetes, hypertension & heart disease. This can lead to a decrease in the body's ability to fight against infections due to a weak immune response.

Lifestyle Factors: A healthy diet and lifestyle gives results in a better immune function. Eating a balanced diet on a regular basis provides proper nourishment to the body and also prevents any vitamin & mineral deficiencies which may hinder the immune response. Some sort of regular physical activity also supports the immune system by increasing the number of fighter cells in the body. One must try to obtain adequate amounts of rest everyday in order to minimize the stress levels which can in turn affect our immunity.

Gut Flora: It is surprising to note that 70% of our immune system is dependent on our gut micro biome. Healthy gut bacteria prevent crowding of harmful bacteria in the intestine, produce lactic acid to stop their growth & work integrally with our immune system. Including fermented foods like curd, buttermilk, kefir, kombucha, kimchi etc. in your diet will help support the growth of good gut bacteria.

Medications: Medications for autoimmune disorders, cancer, HIV or disorders with chronic inflammation like asthma, Crohn's disease, rheumatoid arthritis etc. can also limit the immune response and weaken the body's ability to fight against infections.[7]

How to Boost Immune System Naturally or Different Ways to Boost Immunity: [8]

- Do not smoke.
- Eat fruits and vegetables in diet daily.
- Exercise regularly.
- Maintain healthy body weight.
- Don't drink alcohol, but if you drink only in moderation.
- Get proper sleep.
- Take steps to avoid infection, such as Wash your hand frequently and cooking meats thoroughly.

Natural and Artificial Immunity Boosters:

A. Natural Immunity Boosters: There are a lot of foods, fruits, and vegetables that can naturally enhance your immune system. One of the easiest ways to improve your immunity is to have a healthy and wholesome diet.

Fruits and vegetables that are rich in beta carotene, Vitamin C, Vitamin E, and zinc are good for boosting immunity. These include broccoli, cauliflower, kale, kiwi, orange juice, papaya, red, green or yellow pepper, sweet potato, strawberries, tomatoes, avocados, peanuts, almonds, spinach, eggs, dairy, milk, and more

All kinds of berries, along with foods rich in omega-3 fatty acids such as beans, flax seeds, and even some nuts can be consumed to strengthen immunity

Some of the immunity-boosting herbs are garlic, black cumin, and licorice. Add these to your diet for a healthier and happy immune system.

B. Artificial Immunity Boosters: Many times there is no possibility for us to cover all the minerals and vitamins in our daily diet. Sometimes our regular diet may do not provide sufficient amount of vital immunity boosters to body. At that time we use dietary supplements. Immunity boosters, as the name suggests, are specifically designed to enhance immunity and can replenish all the necessary nutrients required by your body.

Some Best Immunity Boosters That Help You Are As Below: [9]

1. Revite General Wellness and Immunity Capsules (100 capsules) - CRD Ayurveda:

This supplement contains nutrients, vitamins, minerals, and herbs. It helps to improve performance, body weight, appetite, body weight and growth. It also increases utilization of oxygen in the body. It helps to avoid fatigue, weakness, and general disability.

Key Features:

- Number of capsules: 100
- Helps in boosting immunity
- Rejuvenates the body and replenishes vitamins and minerals
- Aids in weight gain and body growth

2. Panchamrit Tulsi Drops - A Natural Immune Booster (30 ml) - Food ARC:

Panchamrit Tulsi drops prepared from combination of five types of Tulsi extract. This panchamrit helps to prevent more than 200 diseases. It helps to remove impurities from the blood. It improves metabolism and reduce anxiety and stress.

Key Features:

- Improves immunity, protects the body against infections and diseases
- Lowers blood sugar levels
- Maintains cholesterol levels
- Keeps stomach healthy

3. Amalaki for Immunity Wellness (Pack of 2 - 60 Capsules each) – Himalaya:

Amalaki is made from Ayurvedic herb, and it is excellent immunity booster. It helps to build body's natural resistance to infection. Amla or Indian Gooseberry is a source of Vitamin C. A unique trait of the Amla fruit is the varied tastes it offers – sweet, sour, pungent, bitter, and astringent.

Key Features:

- It improves digestive system
- It helps to reduce constipation
- Functions as an antioxidant.

4. Guduchi for Immunity Wellness (Pack of 2 - 60 tablets each) – Himalaya:

These tablets made from Indian shrub Guduchi, which boosts immune system. This helps to enhance skin glow. It can also help to treat respiratory problems, abdominal pain, hypersensitivity, and worm infestations.

Key Features:

- Improves skin complexion and health
- Treats bronchitis, chronic cough, and asthma
- Has anti-inflammatory properties.

5. Add-Immune (60 Capsules) - Add Veda:

Add Veda capsules helps to strengthen your immunity. These helps to maintain high energy levels and keep you active whole day. They protect from common allergies, cold, and cough. These capsules also known as immunomodulators.

Key Features:

- Improves immune system
- Improves the digestive system
- Works as detoxifiers

6. Vedic Amrit Immunity Capsules (60 Capsules) Pack of 2 - CRD Ayurveda Improves physical work capacity and increase energy:

These immunity capsules are generally helps to maintain wellness and avoid fatigue by improving endurance and tolerance. They improve appetite and body growth. They help replenish the essential vitamins and minerals in the body.

Key Features:

- Boosts immunity and protects against diseases
- Improves body weight and growth

Regular food material that helps to increase immunity: [10]

- Citrus fruits
- Red bell peppers
- Broccoli

- Garlic
- Ginger
- Spinach
- Yogurt
- Almonds
- Sunflower seeds
- Turmeric
- Green tea
- Papaya
- Kiwi
- Poultry
- Shellfish

Role of Protein in Immune System:

Immune system cells and antibody are dependent on protein. Protein is essential to build body and repair tissue growth. It helps to prevent bacterial and viral infection. Deficiency of protein in diet lead to muscle weakness, fatigue and weak immune system.[11]Protein calorie malnutrition (deficiency of protein) affect host immunity by damaging T cell system.[12]

Role of Vitamin in Immune System:

Vitamin is essential nutrient to build immune response towards pathogen. Vitamins regulate T lymphocytes, cytokines formation and antibodies and promote systematic immune response. Vitamins in regular diet with appropriate quantities support natural defense mechanism by enhancing the immune response.[13] Different vitamins play different role in immune system these are following:

Vitamin A: Vitamin A is fat soluble vitamin. It is a group of unsaturated monohydric alcohol contain acyclic ring. Vitamin A known as anti-inflammatory vitamin because it play essential role in improving immune system. It is also important in maintaining vision, promoting growth and development, protecting epithelium and mucus integrity and treatment of several infectious diseases. Vitamin play role in cellular and humoral immune response.[14]

Vitamin B: Vitamin B is mainly obtained from person's diet. Vitamin B include group of 8 vitamins including B1, B2, B3, B5, B6, B7, B9, B12 etc. Vitamin B play important role in developing biological response. Vitamin B6 helps to make new RBCs. It also improve migraine.[15]

Vitamin C: Most cells of immune system required vitamin C to perform their task. Vitamin C deficiency decreases resistance against pathogen while higher supply improve immune system.[16] It also help to maintain healthy skin, blood vessels, bones and cartilage. It also improve wound healing.[17]

Vitamin E: Vitamin E is fat soluble antioxidant. It helps to protect cells from damage caused by free radicals. It helps to boost immune system and fight off invading viruses, bacteria. It enhances skin epithelium barrier function.[18]

Dose Immune System Differs in Men and Women:

Research shows that women have better immunity than men. Women possess enhanced capacity of producing antibodies. This difference is due to sex hormones and environmental factors.[19]studyin United States shows that females have higher rate of immune diseases. Irritable bowel syndrome (IBS) cause significant abdominal pain is four times more in women than in men. At the Michigan State of university College of Veterinary Medicine the research team found unique sex difference in mast cells which shows why women are more prone to autoimmune diseases. When mast cells of females activated by allergens or by stress it releases more inflammatory substance which provoke more aggressive immune response such as anaphylaxis and leaky gut. Mast cells of male and female have same genes with exception of sex chromosome genes. They found that more than 4000 genes were more active in females mast cells compared with those from males. As women have stronger immune system they produce more effective immune response against virus, toxins and bacteria than men. Reason behind this is not fully understood but mast cell considers being an important factor. Immune response is also important in regulating growth of cancer cells, this is one of the reasons why men have high death rate due to cancer. This immune response is observe across all species.[20]

As Per Age in Difference Occur in Immunity:

Immunosenescence is age related changes in immune response, both cellular and serological change. With increase in age the immunity is decreases and person is more susceptible to infectious diseases, poorer response to vaccination, and increase susceptibility to cancer, autoimmune and chronic disorders. Both adaptive and innate immune response change with aging.[21]Our immune system protects us from harmful substances. Immune system makes antibodies which destroy the foreign particles. Immune system is change with aging, as you get older immune system is become weak.

- The immune response is slower.
- Autoimmune disorder is occurs.
- Healing process also becomes slow.
- Increase risk of cancer.[22]

Increase Immunity in Aging:

- Vaccination: - Get the flu vaccine, pneumonia vaccine and other vaccines.
- Exercise: - Regular physical activity will strengthen your immune system. Physical activity includes walking, yoga, swimming and other low impact workout.
- Healthy diet: - Having healthy diet will boost your immune system. Diet rich in fruits and vegetables is important to boost immunity.
- Lower stress level: - short term stress doesn't harm body but long term stress affect immunity and make susceptible to virus, illness.
- Quit smoking: - smoking can affect badly to the lung and it can produce cancer. It also causes bronchitis, pneumonia etc. Use smoking cessation aid such as nicotine gum and nicotine patch.
- Get enough sleep.
- Limit your alcohol intake.[23,21]

Effect of Environment on Immunity:

Environmental pollution cause different effect on the body. It badly affects immune system. Immune system protects body from invaders. When tiny particles of dust, germs are enter into the body, defense system of body is activated.[24] The harmless bacteria, chemicals, air particles can stimulate immune system leads to adverse effects.[25]Sometimes body's immune system work against body and serious disorder can occur. These disorders are called as autoimmune disorders. The best example of this is rheumatoid arthritis.[24] Sunlight consist of several rays including UV radiations. This source of light is essential for life but also has strong negative effects on human health. It decreases the ability of human defence system to detect and attack malignant cells. It also causes mutagenesis and carcinogenesis.[26]

Effect of Strong and Weak Immunity on Health:

Immune system is protecting body from different harmful substances and foreign material. Strong immune system will help you to protect from disorder which caused by viruses, bacteria, toxins etc. person having weak immune system will more susceptible to cold, flu caused by virus and bacteria.[27] Also the important fact is people having strong immunity are more susceptible to autoimmune disorders like rheumatoid arthritis, Irritable bowel syndrome. The allergic reactions are also occurs. Patients with chronic disorders like cancer, diabetes, kidney and liver disorders are having weak immunity and are more susceptible to disease caused by foreign substance.[28]

CONCLUSION:

Our immune system is designed to fight against pathogens like bacteria and viruses in our environment. Nutrition must be sound, exercise must be regular and spiritual harmony must be attained. Immune system produces antibodies to kill pathogens. During Covid-19 pandemic peoples are understand the importance of immunity, various immunity boosters are now available in market. Enhancing the body's natural defense system (immunity) plays an important role in maintaining optimum health. We all know that prevention is better than cure. It will be good to take preventive measures which boost our immunity in these times. Immunity can also be improved by exercise, healthy diet and by getting enough sleep. The body's inner ability to heal can be taken advantage of by paying attention to each of these areas: sound nutrition, regular exercise, and mental and spiritual health. Stronger immunity has also leads to autoimmune disorders. Maintaining a healthy diet and lifestyle helps to provide nourishment to the body and also promotes the growth of gut friendly bacteria to build a strong immune system which will boost the immune system and fight against infections.

REFERENCES:

1. https://en.wikipedia.org/wiki/Immunity_(medical)
2. Anaya Mukharjee, (November 02, 2020), The Different Types of Immunity & Why You Need To Know About Them, https://skinkraft.com/blogs/articles/different-types-of-immunity.
3. Arthur Cassa Macedo,1 André Oliveira Vilela de Faria,1 and Pietro Ghezzi2,* Boosting the Immune System, From Science to Myth: Analysis the Infosphere With Google, Front Med (Lausanne), 2019; 6:165.
4. Anaya Mukharjee, (November 02, 2020), The Different Types of Immunity & Why You Need To Know About Them, https://skinkraft.com/blogs/articles/different-types-of-immunity.
5. Elea Carey, (May 11, 2019), Immunodeficiency Disorders, https://www.healthline.com/health/immunodeficiency-disorders#prevention.
6. Cleveland Clinic medical professional, (02/23/2020), Immune System,
7. Vasundhara Agrawal, (Apr 25, 2020), 7 Factors that affect your Immune System the Most &Why?,https://medium.com/diet-nutrition/7-factors-that-affect-your-immune-system-the most-why-269a78292624.
8. Harvard Medical School, (Feb. 12, 2021), Helpful ways to strengthen your immune system and fight off disease, https://www.health.harvard.edu/staying-healthy/how-to-boost-your-immune-system.
9. https://www.seniority.in/blog/list-of-immunity-boosters-to-help-you-fight-infections/.
10. James Schend, (April 30, 2020), 15 Foods That Boost the Immune System, https://www.healthline.com/health/food-nutrition/foods-that-boost-the-immune-system.
11. https://www.webmd.com/cold-and-flu/qa/are-highprotein-foods-good-for-the-immune-system.
12. J M Daly [1], J Reynolds, R K Sigal, J Shou, M D Liberman, Effect of dietary protein and amino acids on immune function, Crit Care Med., 1990; 18(2):86-93.
13. Muhammad Farhan Aslam, Saad Majeed, Sidra Aslam and Jazib Ali Irfan, Vitamins: Key Role Players in Boosting Up Immune Response-A Mini Review, Vitamins & Minerals, 2017; 6(1):1-8
14. Zhiyi Huang, Yu Liu, Guangying Qi, David Brand and Song Guo Zheng, Role of Vitamin A in the Immune System, Journal of Clinical Medicine, 2018; 7(9):258.
15. https://renuerx.com/which-vitamin-b-should-i-take-to-boost-my-immune-system/.
16. Ströhle A, Hahn A, Vitamin C and Immunfunktion, [Vitamin C and immune function], Med Monatsschr Pharm., 2009, 32(2), 49-54.
17. https://www.nhs.uk/conditions/vitamins-and-minerals/vitamin-c/.
18. https://ods.od.nih.gov/factsheets/VitaminE-Consumer/.
19. Mihaela Dimitrova, Does the Immune System Differ between Men and Women?, https://www.news-medical.net/health/Does-the-Immune-System-Differ-between-Men-and-Women.aspx.
20. The conversation, (Feb. 14, 2019), who's stronger? An immunological battle of the sexes, https://theconversation.com/whos-stronger-an-immunological-battle-of-the-sexes-111334.
21. astelo-Branco, Camil & Soveral, Iris, The immune system and aging: A review, Gynecological endocrinology, 2013, 30(1), 1-7.
22. https://medlineplus.gov/ency/article/004008.htm.
23. Valencia Higuera, (January 10, 2019), 8 Ways to Boost Your Immune System If You're Over 65, https://www.healthline.com/health/flu/boost-immune-system-over-65.
24. Stephen Ornes, (January 28, 2015), Immunity: Environment can have big impact, https://www.sciencenewsforstudents.org/article/immunity-environment-can-have-big impact.
25. Esser, Charlotte, Environmental Influences on the Immune System, 2016, 1-378.
26. González Maglio DH, Paz ML, Leoni J., Sunlight Effects on Immune System: Is There Something Else in addition to UV-Induced Immunosuppression?, Biomed Res Int., 2016, 1934518.
27. Mary Anne Dunkin, (November 16, 2009), How to Use Your Immune System to Stay Healthy, https://www.webmd.com/a-to-z-guides/features/how-use-your-immune-system-stay-healthy#1.
28. Centers for Disease Control and Prevention, National Center for Emerging and Zoonotic Infectious Diseases, (December 12, 2016), People at Risk - People with Weakened Immune Systems, https://www.cdc.gov/listeria/risk-groups/weakened-immunity.html.