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Immunodeficency disorders involve malfuntion of the immune system and treatment management

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ABSTRACT

Immunodeficiency disorders prevent your body from adequately fighting infections and diseases. An immunodeficiency disorder also makes it easier for you to catch viruses and bacterial infections occurs malfunction of immune system (or) defect in immune function. Categorize immunodeficiency disorders as either congenital or acquired. A congenital or primary disorder is one you were born with. Acquired, or secondary disorders are disorders you get later in life. Primary immunodeficiency disorders are now considered to range from 1:500 to 1:500,000 in the general population in the USA and Europe counters. Secondary immunodeficiency disorders are HIV infection and tuberculosis has caused global increases in the condition. Removing the spleen can weaken your immune system. Aging also weakens your immune system. Proteins are important for your immunity. An insufficient amount of protein in the diet can reduce the strength of your immune system. Your body also produces proteins when you sleep that help your immune system fight infection, commonly used drugs Antibiotics, Antiviral drugs, severe disorders treat stem cell transplantation.

Keywords: Immunodeficiency, Disorders, Immune, Primary immunodeficiency, Secondary immunodeficiency, Immune system.

INTRODUCTION

Immunology deals with physiological functioning of the immune system in states of both health and disease as well as malfunctions of the immune system in immunological disorders like allergies, hypersensitivities, immune deficiency, transplant rejection and autoimmune disorders. It deals with the defence mechanisms including all physical, chemical and biological properties of the organism that help it to combat its susceptibility to foreign organisms, material, etc. Immunology deals with the relationship between the body systems, pathogens, and immunity.

Allergic diseases depend on dysregulated immune responses to normally innocuous substances. The origin and cause of the disease is multifactorial and the interaction between genetic disposition, allergen exposure and non-specific adjuvant factors is of importance. The prevalence of allergic diseases in developed countries has increased during the last decades and several contributing factors to this have been proposed, including changes in lifestyle and dietary habits, reduction in infections and environmental pollution. According to the World Health Organization, 50million people suffer autoimmune diseases. Autoimmune diseases causes

of death in female children and women in all age groups. The most important part is treatment; treatment depends on the specific disease and your symptoms, most commonly used immunosuppressive medicines and vitamins such as B12.

IMMUNE SYSTEM

The immune system has evolved to protect the host from pathogens while minimizing damage to self tissue recognized in 19th century. More recently it has become clear that the only protects against infection, but also limits excessive responses that might lead to autoimmune diseases, a wide variety of diseases, involving every organ system in the body. [3]

Classification

The immune system is the collection of cells, tissues and molecules that protects the body from numerous pathogenic microbes and toxins in our environment. This defense against microbes has been divided into two general types of reactions: reactions of innate immunity and reactions of adaptive immunity. Thus, innate and adaptive immunity can be thought of as two equally important aspects of the immune system. As you will see, each aspect differs with respect to how quickly it responds and for how long it responds to pathogens, its central effectors cell types and its specificity for different classes of microbes.

Innate immune system	Adaptive immune system
Response is non-specific	Pathogen and antigen specific response
Exposure leads to immediate maximal response	Lag time between exposure and maximal response
Cell-mediated and humoral components	Cell-mediated and humoral components
No immunological memory	Exposure leads to immunological memory
Found in nearly all forms of life	Found only in jawed vertebrates

Innate immune system

Microorganisms or toxins that successfully enter an organism encounter the cells and mechanisms of the innate immune system. The innate response is usually triggered when microbes are identified by pattern recognition receptors, which recognize components that are conserved among broad groups of microorganisms, or when damaged, injured or stressed cells send out alarm signals, many of which (but not all) are recognized by the same receptors as those that recognize pathogens. Innate immune defenses are non-specific, meaning these systems respond to pathogens in a generic way. This system does not confer long-lasting immunity against a pathogen. The innate immune system is the dominant system of host defense in most organisms. [4]

Surface barriers:

Several barriers protect organisms from infection, including mechanical, chemical, and biological barriers. The waxy cuticle of many leaves, the exoskeleton of insects, the shells and membranes of externally deposited eggs, and skin are examples of mechanical barriers that are the first line of defense against infection. [5] However, as organisms cannot be completely sealed from their environments, other systems act to protect body openings such as the lungs, intestines and the genitourinary tract. In the lungs, coughing and sneezing mechanically eject pathogens and other irritants from the respiratory tract. The flushing action of tears and urine also mechanically expels pathogens, while mucus secreted by the respiratory and gastrointestinal tract serves to trap and entangle microorganisms.

Chemical barriers also protect against infection. The skin and respiratory tract secrete antimicrobial peptides such as the β-defensins. [6] Enzymes such as lysozyme and phospholipase A2 in saliva, tears, and breast milk are also anti-bacterial. [7, 8] Vaginal secretions serve as a chemical barrier following menarche, when they become slightly acidic, while semen contains defensins and zinc to kill pathogens. In the stomach, gastric acid and proteases serve as powerful chemical defenses against ingested pathogens.

Within the genitourinary and gastrointestinal tracts, commensally flora serve as biological barriers by competing with pathogenic bacteria for food and space and, in some cases, by changing the conditions in their environment, such as pH or available iron.[9] This reduces the probability that pathogens will reach sufficient numbers to cause illness. However, since most antibiotics non-specifically target bacteria and

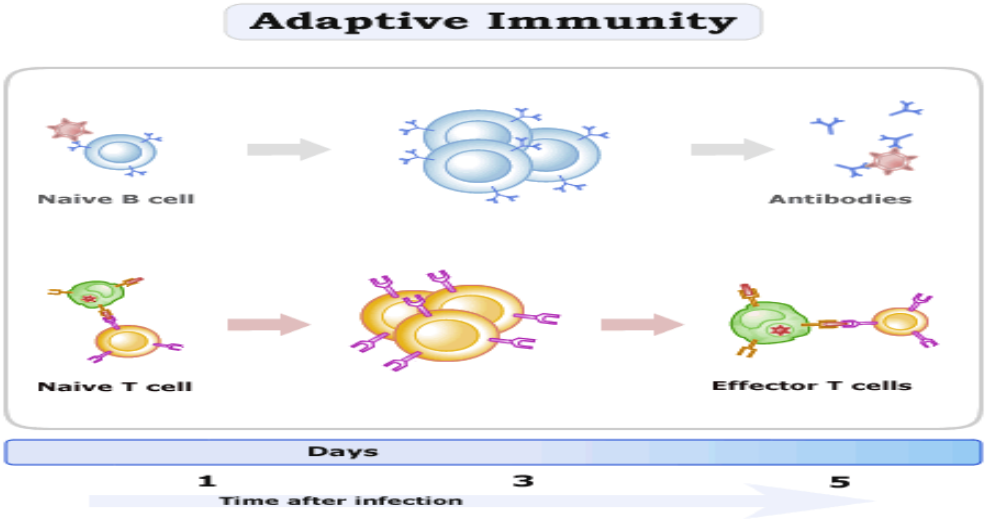
do not affect fungi, oral antibiotics can lead to an "overgrowth" of fungi and cause conditions such as a vaginalcandidiasis (a yeast infection).[10] There is good evidence that re-introduction of probiotic flora, such as pure cultures of the lactobacilli normally found in unpasteurized yogurt, helps restore a healthy balance of microbial populations in intestinal infections in children and encouraging preliminary data in studies on bacterial gastroenteritis, inflammatory bowel diseases, urinary tract infection and post-surgical infections. [11, 12, 13]

Inflammation

Inflammation is one of the first responses of the immune system to infection. [14, 15] The symptoms of inflammation are redness, swelling, heat, and pain, which are caused by increased blood flow into tissue. Inflammation is produced by eicosanoids and cytokines, which are released by injured or infected cells. Eicosanoids include prostaglandins that produce fever and the dilation of blood vessels associated with inflammation, and leukotrienes that attract certain white blood cells (leukocytes).[16,17] Common cytokines includeinterleukins that are responsible for communication between white blood cells; chemokines that promote chemotaxis; and interferons that have anti-viral effects, such as shutting down protein synthesis in the host cell. [18,19] Growth factors and cytotoxic factors may also be released. These cytokines and other chemicals recruit immune cells to the site of infection and promote healing of any damaged tissue following the removal of pathogens. [20]

Adaptive immune system

The adaptive immune system, on the other hand, is called into action against pathogens that are able to evade or overcome innate immune defenses. Components of the adaptive immune system are normally silent; however, when activated, these components "adapt" to the presence of infectious agents by activating, proliferating, and creating potent mechanisms for neutralizing or eliminating the microbes. There are two types of adaptive immune responses: humoral immunity, mediated by antibodies produced by B lymphocytes, and cell-mediated immunity, mediated by T lymphocytes.



Humoral immunity (B lymphocytes)

B lymphocytes: Bone marrow-derived lymphocytes, or B lymphocytes, comprise 10% to 20% of circulating peripheral lymphocytes and are also present in bone marrow and other lymphoid tissues (i.e. spleen, lymph nodes, tonsils and other mucosal tissues). These are the only cells that produced antibodies. B cells recognize antigens via membrane bound antibodies, which unlike T cells, whose receptors can only recognize small peptides, are capable of recognizing many different chemical structures (proteins, lipids, polysaccharides, etc). When stimulated by a microbial antigen, B cells differentiate into plasma cells, which secrete large amount of antibodies. These antibodies then bind the microbial antigen, neutralizing the microbe or marking it for destruction by phagocytes.

Cell- mediated immunity (T lymphocytes)

T lymphocytes: thymus-derived lymphocytes, or T lymphocytes, comprise 60% to 70% of circulating peripheral lymphocytes and are major population in the spleen and peripheral lymph nodes. Unlike B cells, which recognize circulating antigens of many chemical structures, the vast majority of T cells (>95%) are only able to recognize peptide fragments that are displayed by specialized molecules called MHC molecules on the cytosol or contained within ingested vesicles of various cells. There are two major subsets of T cells which proliferate when stimulated CD4+ 'helper' T cells secrete soluble molecules which help B cells to produce antibodies and activate macrophages to eliminate endocytosed microbes. CD8+ cytotoxic T cells can also secrete soluble mediators but play a more important role in directly killing virus-infested or tumor cells. After a response, T memory cells persist, which 'remember' particular antigens and are ready to respond faster and more potently to re- exposure.

IMMUNE DEFICIENCY AND IMMUNODEFICIENCY DISORDERS

Immune deficiency

The consequence of deficiencies of the immune system includes recurrent infection, autoimmunity and susceptibility to malignancy. Immune deficiency many arise through intrinsic defect in immune function, but are much more commonly due to secondary including drug therapy, malignancy and ageing. Immune deficiency classified tow types based on causative originates in the immune system.

Primary immune deficiency

A number of rare diseases feature a heightened susceptibility to infections from childhood onward. Primary Immunodeficiency is also known as congenital immunodeficiency. Many of these disorders are hereditary and are autosomal recessive or X-linked. There are over 80 recognised primary immunodeficiency syndromes; they are generally grouped by the part of the immune system that is malfunctioning, such as lymphocytes or granulocytes.

The treatment of primary immunodeficiency depends on the nature of the defect, and may involve antibody infusions, long-term antibiotics and (in some cases) stem cell transplantation.

Secondary immune deficiency

Secondary immunodeficiency, also known as acquired immunodeficiency, can result from various immunosuppressive agents, for example, malnutrition, aging and particular medications (e.g., chemotherapy, disease-modifying,anti-rheumaticdrugs, immunosuppressive drugs after organ-transplants, glucocorticoids). For medications, the termimmunosuppression generally refers to both beneficial and potential adverse effects of decreasing the function of the immune system, while the term immunodeficiency generally refers solely to the adverse effect of increased risk for infection.

Many specific diseases directly or indirectly cause immunosuppression. This includes many types of cancer, particularly those of the bone marrow and blood cells (leukemia, lymphoma, multiple myeloma), and certain chronic infections. Immunodeficiency is also the hallmark of acquired immunodeficiency syndrome (AIDS), [21] caused by the human immunodeficiency virus (HIV). HIV directly infects a small number of T helper cells, and also impairs other immune system responses indirectly.

Immunodeficiency disorders

Immunodeficiency disorders impair the immune system's ability to defend the body against foreign or abnormal cells that invade or attack it (such as bacteria, viruses, fungi, and cancer cells). As a result, unusual bacterial, viral, or fungal infections or lymphomas or other cancers may develop. Another problem is that up to 25% of people who have an immunodeficiency disorder also have an autoimmune disorder (such as immune thrombocytopenia). In an autoimmune disorder, the immune system attacks the body's own tissue. Sometimes the autoimmune disorder develops before the immunodeficiency causes any symptoms.

There are two types of immunodeficiency disorders:

Primary

These disorders are usually present at birth and are usually hereditary. They typically become evident during infancy or childhood. There are more than 100 primary immunodeficiency disorders. All are relatively rare

- X-linked agammaglobulinemia (XLA)
- Common variable immunodeficiency (CVID)

- Severe combined immunodeficiency (SCID), which is known as "boy in a bubble" disease
- Alymphocytosis

Secondary

These disorders generally develop later in life and outside source, such as a toxic chemical or infection, attacks your body. Severe burns and radiation also can cause secondary disorders. Secondary disorders include:

- AIDS
- Cancers of the immune system, such as leukemia
- Immune-complex diseases, such as viral hepatitis
- Multiple myeloma (a cancer of the plasma cells, which produce antibodies)
- Protein loss - for example, due to nephrotic syndrome.[22]

Symptoms

People with an immunodeficiency disorder tend to have one infection after another. Usually, respiratory infections (such as sinus and lung infections) develop first and recur often. Most people eventually develop severe bacterial infections that persist, recur, or lead to complications. For example, sore throats and head colds may progress to pneumonia. However, having many colds does not necessarily suggest an immunodeficiency disorder.

Infections of the mouth, eyes, and digestive tract are common. Thrush, a fungal infection of the mouth, may be an early sign of an immunodeficiency disorder. Sores may form in the mouth. People may have chronic gum disease (gingivitis) and frequent ear and skin infections. [23,24] Bacterial infections (for example, with staphylococci) may cause pus-filled sores to form (pyoderma). People with certain immunodeficiency disorders may have many large, noticeable warts (caused by viruses).

- ✓ Many people have fevers and chills and lose their appetite and/or weight.
- ✓ Abdominal pain may develop, possibly because the liver or spleen is enlarged.
- ✓ Infants or young children may have chronic diarrhea and may not grow and develop as expected (called failure to thrive). Immunodeficiency may be more severe if symptoms develop in early childhood than if they develop later.
- ✓ Other symptoms vary depending on the severity and duration of the infections.
- ✓ Primary immunodeficiency may occur as part of a syndrome with other symptoms. These other symptoms are often more easily recognized than those of the immunodeficiency. For example, doctors may recognize DiG eorge syndrome because affected infants have low-set ears, a small jawbone that recedes, and wide-set eyes.

Diagnosis

Doctors must first suspect that an immunodeficiency exists. Then they do tests to identify the specific immune system abnormality.

Doctors suspect immunodeficiency when a person develops recurrent infections (typically sinusitis, bronchitis, middle ear infections, or pneumonia). Doctors also may suspect immunodeficiency when infections are severe or unusual or when a severe infection is caused by an organism that normally does not cause severe infection (such as *Pneumocystis* fungi or cytomegalovirus).

Results of a physical examination may suggest immunodeficiency and sometimes the type of immunodeficiency disorder. For example, doctors suspect certain types of immunodeficiency disorders when lymph nodes and tonsils are extremely small and other types when lymph nodes and tonsils are swollen and tender. [25]

To help identify the type of immunodeficiency disorder, doctors ask at what age the person began to have recurring or unusual infections or other characteristic symptoms. Different types of immunodeficiency disorders are more likely depending on the age at which infections starts, as in the following:

- Younger than 6 months: Usually an abnormality in T cells
- Age 6 to 12 months: Possibly a problem with B cells and T cells
- Older than 12 months: Usually an abnormality in B cells and antibody production [26]

Laboratory test

- Laboratory tests are needed to confirm the diagnosis of immunodeficiency and to identify the type of immunodeficiency disorder. A blood sample is taken and analyzed to determine the total number of white blood cells and the percentages of each main type of white blood cell. The white blood cells are examined under a microscope for abnormalities. Doctors also

determine immunoglobulin levels, the number of red blood cells and platelets, and the levels of certain specific antibodies produced after the person is given vaccines. If any results are abnormal, additional tests are usually done.[27]

- Skin tests may be done if the immunodeficiency is thought to be due to a T-cell abnormality. The skin test resembles the tuberculin skin test, which is used to screen for tuberculosis. Small amounts of proteins from common infectious organisms such as yeast are injected under the skin. [28] If a reaction (redness, warmth, and swelling) occurs within 48 hours, the T cells are functioning normally. No reaction could suggest a T-cell abnormality. Or doctors can check for T-cell abnormalities by doing blood tests to determine the number of T cells and to evaluate T-cell function.
- People whose families are known to carry a gene for a hereditary immunodeficiency disorder may wish to have genetic testing to learn whether they carry the gene for the disorder and what their chances of having an affected child are. Talking with a genetic counselor before testing is helpful. Several immunodeficiency disorders, such as X-linked agammaglobulinemia, Wiskott-Aldrich syndrome, severe combined immunodeficiency, and chronic granulomatous disease. [29]

Prevention

Some of the disorders that can cause immunodeficiency can be prevented and/or treated, thus helping prevent immunodeficiency from developing. The following are examples:

- HIV infection: Following safe sex guidelines and not sharing needles to inject drugs can reduce the spread of this infection. Also, antiretroviral drugs can usually treat HIV infection effectively.
- Cancer: Successful treatment usually restores the function of the immune system unless people need to continue taking immunosuppressants.
- Diabetes: Good control of blood sugar levels can help white blood cells function better and thus prevent infections.

Strategies for preventing and treating infections depend on the type of immunodeficiency disorder. For example, people who have an immunodeficiency disorder due to a deficiency of antibodies are at risk of bacterial infections. The following can help reduce the risk:

- Being treated periodically with immune globulin (antibodies obtained from the blood of people with a normal immune system) given intravenously or under the skin
- Practicing good personal hygiene (including conscientious dental care)
- Not eating undercooked food
- Not drinking water that may be contaminated
- Avoiding contact with people who have infections [30]

Treatment management

The goal of treatment is to prevent infections and treat any disease and infections that do develop. The treatment for each immunodeficiency disorder will be tailored to its specific conditions commonly used antibiotics and antibody replacement. [22]

Antibiotics

Are given as soon as a fever or another sign of an infection develops and before surgical and dental procedures, which may introduce bacteria into the bloodstream. If a disorder (such as severe combined immunodeficiency) increases the risk of developing serious infections or particular infections, people may be given antibiotics to prevent these infections.

Antiviral drugs

Are given at the first sign of infection if people have an immunodeficiency disorder that increases the risk of viral infections (such as immunodeficiency due to a T-cell abnormality). These drugs include amantadine for influenza and acyclovir for herpes or chickenpox. [31, 32]

Vaccines

Are given if the specific immunodeficiency disorder does not affect antibody production. Vaccines are given to stimulate the body to produce antibodies that recognize and attack specific bacteria or viruses. If the person's immune system cannot make antibodies, giving a vaccine does not result in the production of antibodies and can even result in illness. For example, if a disorder does not affect production of antibodies, people with that disorder are given the influenza vaccine given once a year. Doctors may also give this vaccine to the person's immediate family members and to people who have

close contact with the person. Generally, live-virus vaccines are not given to people who have a B- or T-cell abnormality because these vaccines may cause an infection in such people.[33] Live-virus vaccines include rotavirus vaccines, measles-mumps-rubella vaccine, chickenpox (varicella) vaccine, varicella-zoster (shingles) vaccine, bacille Calmette-Guérin (BCG) vaccine, and influenza vaccine given as a nasal spray. A live-virus oral poliovirus vaccine is no longer used in the United States but is used in some other parts of the world.

Stem cell transplantation

Can correct some immunodeficiency disorders, particularly severe combined immunodeficiency. Stem cells are usually obtained from bone marrow but occasionally from blood (including umbilical cord blood). Stem cell transplantation, which is available at some major medical centers, is usually reserved for severe disorders. Transplantation of thymus tissue is sometimes helpful. Gene therapy for a few congenital immunodeficiency disorders has been successful. With appropriate treatment, many people with an immunodeficiency disorder have a normal life span. However, some require intensive and frequent treatments throughout life. Others, such as those with severe combined immunodeficiency, die during infancy unless they are given a bone marrow or stem cell transplant. [34]

CONCLUSION

Immune system play important role protect the host from pathogens while minimising damage to self tissue, recovery from disease and frequently protection against that condition. The malfunction of immune system cases many immunodeficiency disorders

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