TDC 5TH SEM MAJOR: PAPER 5.3

HYPER IMMUNITY:(ALLERGY, IMMUNE DEFICIENCY,AUTOIMMUNITY,BASIC CONCEPT)

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Hyperimmunization or hyperimmunity is the presence of a larger than normal number of antibodies to a specific antigen or the presence in the body of an excessive number of antibodies to a specific antigen. This creates a state of immunity that is greater than normal.

According to this hypothesis, allergy symptoms are secondary effects of hyperimmunity and effective immune vigilance.

TGF-[beta]: an important mediator of allergic disease and a molecule with dual activity in cancer development

Hyperimmune may refer to:

A hyperimmune set in computability theory

Hyperimmunization, the presence of a larger-than-normal number of antibodies

Hyperimmune globulin, a substance similar to Intravenous Immunoglobulin (IVIG)

ALLERGY,

A damaging immune response by the body to a substance, especially a particular food, pollen, fur, or dust, to which it has become hypersensitive.

About Allergy

An allergy is a medical condition in which the body's immune system reacts abnormally to a foreign substance. The substance that causes the allergy is called an allergen.

Allergic diseases have been rapidly increasing since the last few decades affecting 20% to 30% of the total population in India. The common allergic disorders in India comprises of asthma, allergic rhinitis, eczema, anaphylaxis, drug, food, insect allergy, and urticaria.

Causes of Allergy

Interaction of Genetic and environmental factors leads to the development of the allergy

Genetic predisposition
Environmental Factors: A broad range of allergen has been found in India owing to climatic variation, diverse vegetation, and different food habits
Exposure to allergens or irritants may trigger the allergic reaction
Dust mite droppings
Animal dander
Grain pollens
Fungal spores
Insect sting/bites
Latex (natural rubber)
Diet
Medications
Pollutant
Tobacco smoke
Exhaust fumes
Exposure to microorganism [bacteria and viruses] during childhood

The major routes of allergen exposure in India are

Inhalation (airborne pollen grains triggers asthma)
Contact (contact dermatitis)
Ingestion (food allergy)
Symptoms of Allergy
The degree of an allergic reaction may vary from mild to severe. The body reacts differently to different allergens

Common symptoms experienced in an allergic reaction are:

Itchy skin, rash, hives (urticaria)
Watery eyes
Sneezing
Difficulty in breathing
Swelling of body parts exposed to the allergen
Stomach ache
Vomiting
Anaphylaxis (swelling of the lips, tongue, and throat, fainting) is an extreme form of allergy, which needs immediate medical attention.

Types of Allergies

Allergy Types	Symptoms	Treatments
Food Allergy	Vomiting, stomach pain, rashes	Avoid Allergen food entirely
Skin allergy	Rashes, hives, itchy bumps	Take a cold shower Apply calamine lotion Talk to Doctor
Dust allergy	Sneezing, coughing, teary eyes	Wear a mask while cleaning Use clean pillows and linens
Insect Allergy	Pain, redness, rashes	Avoid insects See the doctor
Drug Allergy	Rash, urticaria, shortness of breath	Avoid triggers Antihistamines or oral /injected corticosteroids under supervision in a hospital or clinic
Allergic rhinitis	Running nose, nasal block, sneezing	Stay indoors during the pollen season Talk to your GP

Food Allergy

It is an allergic reaction to food or substance in food. Common foods found to cause allergy are Legumes (Kidney beans, Black gram), seafood (prawns), eggplant, milk, egg.

Signs and Symptoms of Food Allergy

Body Parts	Signs and Symptoms of Food Allergy
Gastrointestinal tract	Vomiting, Stomach cramps, bloating, diarrhea
Skin	Rash, Hives
Cardiovascular system	Dizziness, fainting, weak pulse
Respiratory tract;	Cough, shortness of breath
Other	Swelling of the lips, face, and throat Anaphylaxis

Skin Allergy

Eczema (Atopic dermatitis): Itchy dry red skin due to exposure to allergens and food

Contact Dermatitis: An allergic reaction due to contact of skin with an irritant or an allergen may cause a red rash, blisters, itching, cracking, scaling and burning

Hives (urticaria): Raised, itchy bumps on the skin due to food, insect bite, medications

Angioedema: Swelling in deep layers of skin due to allergic reactions to food, medications, insect bites

Dust allergy

Allergy due to dust mite, pollen grains, animal dander or fungal spore.

Insect Allergy

Allergy due to insect stings (bees, wasps) and bites (Mosquitoes, bedbugs, fleas).

Drug Allergy

Allergic reaction due to intake of liquid, pill or injectable form of medication.

Allergic rhinitis (Hay fever)

Seasonal (during pollen season) or Perennial (throughout the year) allergic rhinitis occurs due to airborne pollen grains, dust mites, animal fur, fungal spores.

Management of Allergy

Diagnosis: Types of Allergy Tests

The 3 main tests for allergy are the skin prick test, blood test, and patch test.

Treatment of Allergy

The ideal solution is to stay away from the allergen that you know you are allergic to. However this is not always possible and treatment includes anti-allergic drugs like antihistaminics, decongestants, and steroids.

It is important to know about your allergies before you get affected. If you are not sure, or the symptoms are not subsiding then consult a doctor online to discuss your problems.

IMMUNE DEFICIENCY,

Immunodeficiency, also known as immunocompromisation, is a state in which the immune system's ability to fight infectious diseases and cancer is compromised or entirely absent. Most cases are acquired ("secondary") due to extrinsic factors that affect the patient's immune system.

In clinical settings, immunosuppression by some drugs, such as steroids, can either be an adverse effect or the intended purpose of the treatment. Examples of such use is in organ transplant surgery as an anti-rejection measure and in patients suffering from an overactive immune system, as in autoimmune diseases. Some people are born with intrinsic defects in their immune system, or primary immunodeficiency.

Types

By affected component

Humoral immune deficiency (including B cell deficiency or dysfunction), with signs or symptoms depending on the cause, but generally include signs of hypogammaglobulinemia (decrease of one or more types of antibodies) with presentations including repeated mild respiratory infections, and/or agammaglobulinemia (lack of all or most antibody production) which results in frequent severe infections and is often fatal.

T cell deficiency, often causes secondary disorders such as acquired immune deficiency syndrome (AIDS).
Granulocyte deficiency, including decreased numbers of granulocytes (called as granulocytopenia or, if absent, agranulocytosis) such as of neutrophil granulocytes (termed neutropenia). Granulocyte deficiencies also include decreased function of individual granulocytes, such as in chronic granulomatous disease.

Asplenia, where there is no function of the spleen
Complement deficiency is where the function of the complement system is deficient
In reality, immunodeficiency often affects multiple components, with notable examples including severe combined immunodeficiency (which is primary) and acquired immune deficiency syndrome (which is secondary).

Comparison of immunodeficiencies by affected component

	Affected components	Main causes[6]	Main pathogens of resultant infections[6]
Humoral immune deficiency **B cell deficiency**	B cells, plasma cells or antibodies	• Primary humoral • Multiple myeloma • Chronic lymphoid leukemia • AIDS	• *Streptococcus pneumoniae* • *Hemophilus influenzae* • *Pneumocystis jirovecii* • *Giardia intestinalis* • *Cryptosporidium parvum*
T cell deficiency	T cells	• Marrow and other transplantation • AIDS • Cancer chemotherapy • Lymphoma • Glucocorticoid therapy	Intracellular pathogens, including *Herpes simplex virus*, *Mycobacterium*, *Listeria*,[7] and intracellular fungal infections.[6]
Neutropenia	Neutrophil granulocytes	• Chemotherapy • Bone marrow transplantation • Dysfunction, such as chronic granulomatous disease	• *Enterobacteriaceae* • Oral *Streptococci* • *Pseudomonas aeruginosa* • *Enterococcus* species • *Candida* species • *Aspergillus* species

Asplenia	Spleen	• Splenectomy
		• Trauma
		• Sickle-cell anemia
			• Polysaccharide encapsulated bacteria,[8] particularly:
			  • *Streptococcus pneumoniae*[8]
			  • *Haemophilus influenzae*[8]
			  • *Neisseria meningitidis*[8]
			• *Plasmodium* species
			• *Babesia* species

Complement deficiency	Complement system	• Congenital deficiencies	• *Neisseria* species • *Streptococcus pneumoniae*

Primary or secondary

The distinction between primary versus secondary immunodeficiencies is based on, respectively, whether the cause originates in the immune system itself or is, in turn, due to insufficiency of a supporting component of it or an external decreasing factor of it.

Primary immunodeficiency

A number of rare diseases feature a heightened susceptibility to infections from childhood onward. Primary Immunodeficiency is also known as congenital immunodeficiencies. Many of these disorders are hereditary and are autosomal recessive or X-linked. There are over 95 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 immunodeficiencies depends on the nature of the defect, and may involve antibody infusions, long-term antibiotics and (in some cases) stem cell transplantation. The characteristics of lacking and/or impaired antibody functions can be related to illnesses such as X-Linked Agammaglobulinemia and Common Variable Immune Deficiency

Secondary immunodeficiencies

Immunosuppression

Secondary immunodeficiencies, also known as acquired immunodeficiencies, can result from various immunosuppressive agents, for example, malnutrition, aging, particular medications (e.g., chemotherapy, disease-modifying antirheumatic drugs, immunosuppressive drugs after organ transplants, glucocorticoids) and environmental toxins like mercury and other heavy metals, pesticides and petrochemicals like styrene, dichlorobenzene, xylene, and ethylphenol. For medications, the term immunosuppression 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),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.

Various hormonal and metabolic disorders can also result in immune deficiency including anemia, hypothyroidism and hyperglycemia.

Smoking, alcoholism and drug abuse also depress immune respo

AUTOIMMUNITY

Autoimmunity is the system of immune responses of an organism against its own healthy cells and tissues. Any disease that results from such an aberrant immune response is termed an "autoimmune disease". Prominent examples include celiac disease, post-infectious IBS, diabetes mellitus type 1, Henloch Scholein Pupura (HSP) sarcoidosis, systemic lupus erythematosus (SLE), Sjögren syndrome, eosinophilic granulomatosis with polyangiitis, Hashimoto's thyroiditis, Graves' disease, idiopathic thrombocytopenic purpura, Addison's disease, rheumatoid arthritis (RA), ankylosing spondylitis, polymyositis (PM), dermatomyositis (DM) and multiple sclerosis (MS). Autoimmune diseases are very often treated with steroids

Immunological tolerance

Pioneering work by Noel Rose and Ernst Witebsky in New York, and Roitt and Doniach at University College London provided clear evidence that, at least in terms of antibody-producing B cells (B lymphocytes), diseases such as rheumatoid arthritis and thyrotoxicosis are associated with loss of immunological tolerance, which is the ability of an individual to ignore "self", while reacting to "non-self". This breakage leads to the immune system's mounting an effective and specific immune response against self determinants. The exact genesis of immunological tolerance is still elusive, but several theories have been proposed since the mid-twentieth century to explain its origin.

Three hypotheses have gained widespread attention among immunologists:

Clonal deletion theory, proposed by Burnet, according to which self-reactive lymphoid cells are destroyed during the development of the immune system in an individual. For their work Frank M. Burnet and Peter B. Medawar were awarded the 1960 Nobel Prize in Physiology or Medicine "for discovery of acquired immunological tolerance".

Clonal anergy theory, proposed by Nossal, in which self-reactive T- or B-cells become inactivated in the normal individual and cannot amplify the immune response.

Idiotype network theory, proposed by Jerne, wherein a network of antibodies capable of neutralizing self-reactive antibodies exists naturally within the body

In addition, two other theories are under intense

Clonal ignorance theory, according to which autoreactive T cells that are not represented in the thymus will mature and migrate to the periphery, where they will not encounter the appropriate antigen because it is inaccessible tissues. Consequently, auto-reactive B cells, that escape deletion, cannot find the antigen or the specific helper T cell.

Suppressor population or Regulatory T cell theory, wherein regulatory T-lymphocytes (commonly CD4+FoxP3+ cells, among others) function to prevent, downregulate, or limit autoaggressive immune responses in the immune system.

Tolerance can also be differentiated into "central" and "peripheral" tolerance, on whether or not the above-stated checking mechanisms operate in the central lymphoid organs (thymus and bone marrow) or the peripheral lymphoid organs (lymph node, spleen, etc., where self-reactive B-cells may be destroyed). It must be emphasised that these theories are not mutually exclusive, and evidence has been mounting suggesting that all of these mechanisms may actively contribute to vertebrate immunological tolerance.

Immunodeficiency and autoimmunity

There are a large number of immunodeficiency syndromes that present clinical and laboratory characteristics of autoimmunity. The decreased ability of the immune system to clear infections in these patients may be responsible for causing autoimmunity through perpetual immune system activation.

One example is common variable immunodeficiency (CVID) where multiple autoimmune diseases are seen, e.g.: inflammatory bowel disease, autoimmune thrombocytopenia and autoimmune thyroid disease.

Familial hemophagocytic lymphohistiocytosis, an autosomal recessive primary immunodeficiency, is another example. Pancytopenia, rashes, swollen lymph nodes and enlargement of the liver and spleen are commonly seen in such individuals. Presence of multiple uncleared viral infections due to lack of perforin are thought to be responsible.

Genetic factors

Certain individuals are genetically susceptible to developing autoimmune diseases. This susceptibility is associated with multiple genes plus other risk factors. Genetically predisposed individuals do not always develop autoimmune diseases.

Three main sets of genes are suspected in many autoimmune diseases. These genes are related to:

Immunoglobulins
T-cell receptors
The major histocompatibility complexes (MHC).
The first two, which are involved in the recognition of antigens, are inherently variable and susceptible to recombination. These variations enable the immune system to respond to a very wide variety of invaders, but may also give rise to lymphocytes capable of self-reactivity.

HLA DR2 is strongly positively correlated with systemic lupus erythematosus, narcolepsy[10] and multiple sclerosis, and negatively correlated with DM Type 1.
HLA DR3 is correlated strongly with Sjögren syndrome, myasthenia gravis, SLE, and DM Type 1.
HLA DR4 is correlated with the genesis of rheumatoid arthritis, Type 1 diabetes mellitus, and pemphigus vulgaris

Sex

There is some evidence that a person's sex may also have some role in the development of autoimmunity; that is, most autoimmune diseases are sex-related. A few autoimmune diseases that men are just as or more likely to develop as women include: ankylosing spondylitis, type 1 diabetes mellitus, granulomatosis with polyangiitis, Crohn's disease, Primary sclerosing cholangitis and psoriasis.

Environmental factors

Infectious diseases and parasites

An interesting inverse relationship exists between infectious diseases and autoimmune diseases. In areas where multiple infectious diseases are endemic, autoimmune diseases are quite rarely seen. The reverse, to some extent, seems to hold true. The hygiene hypothesis attributes these correlations to the immune-manipulating strategies of pathogens. While such an observation has been variously termed as spurious and ineffective, according to some studies, parasite infection is associated with reduced activity of autoimmune disease

Chemical agents and drugs

Certain chemical agents and drugs can also be associated with the genesis of autoimmune conditions, or conditions that simulate autoimmune diseases. The most striking of these is the drug-induced lupus erythematosus. Usually, withdrawal of the offending drug cures the symptoms in a patient.

Cigarette smoking is now established as a major risk factor for both incidence and severity of rheumatoid arthritis. This may relate to abnormal citrullination of proteins, since the effects of smoking correlate with the presence of antibodies to citrullinated peptides.

Classification

Autoimmune diseases can be broadly divided into systemic and organ-specific or localised autoimmune disorders, depending on the principal clinico-pathologic features of each disease.

Systemic autoimmune diseases include coeliac disease, lupus erythematosus, Sjögren syndrome, sarcoidosis, scleroderma, rheumatoid arthritis, cryoglobulinemic vasculitis, and dermatomyositis. These conditions tend to be associated with autoantibodies to antigens which are not tissue specific. Thus although polymyositis is more or less tissue specific in presentation, it may be included in this group because the autoantigens are often ubiquitous t-RNA synthetases.

Local syndromes which affect a specific organ or tissue:
Endocrinologic: diabetes mellitus type 1, Hashimoto's thyroiditis, Addison's disease
Gastrointestinal: Crohn's disease, pernicious anaemia
Dermatologic: pemphigus vulgaris, vitiligo
Haematologic: autoimmune haemolytic anaemia, idiopathic thrombocytopenic purpura
Neurological: multiple sclerosis, myasthenia gravis, autoimmune encephalitis, gluten ataxia

Nutrition and autoimmunity

Vitamin D/Sunlight

Because most human cells and tissues have receptors for vitamin D, including T and B cells, adequate levels of vitamin D can aid in the regulation of the immune system.Vitamin D plays a role in immune function by acting on T cells and natural killer cells. Research has demonstrated an association between low serum vitamin D and autoimmune diseases, including multiple sclerosis, type 1 diabetes, and Systemic Lupus Erythematosus (commonly referred to simply as lupus). However, since photosensitivity occurs in lupus, patients are advised to avoid sunlight which may be responsible for vitamin D deficiency seen in this disease.Polymorphisms in the vitamin D receptor gene are commonly found in people with autoimmune diseases, giving one potential mechanism for vitamin D's role in autoimmunity. There is mixed evidence on the effect of vitamin D supplementation in type 1 diabetes, lupus, and multiple sclerosis.

Omega-3 Fatty Acids

Studies have shown that adequate consumption of omega-3 fatty acids counteracts the effects of arachidonic acids, which contribute to symptoms of autoimmune diseases. Human and animal trials suggest that omega-3 is an effective treatment modality for many cases of Rheumatoid Arthritis, Inflammatory Bowel Disease, Asthma, and Psoriasis.

While major depression is not necessarily an autoimmune disease, some of its physiological symptoms are inflammatory and autoimmune in nature. Omega-3 may inhibit production of interferon gamma and other cytokines which cause the physiological symptoms of depression. This may be due to the fact that an imbalance in omega-3 and omega-6 fatty acids, which have opposing effects, is instrumental in the etiology of major depression

Probiotics/Microflora :Various types of bacteria and microflora present in fermented dairy products, especially Lactobacillus casei, have been shown to both stimulate immune response to tumors in mice and to regulate immune function, delaying or preventing the onset of nonobese diabetes. This is particularly true of the Shirota strain of L. casei (LcS). The LcS strain is mainly found in yogurt and similar products in Europe and Japan, and rarely elsewhere.

Antioxidants :It has been theorized that free radicals contribute to the onset of type-1 diabetes in infants and young children, and therefore that the risk could be reduced by high intake of antioxidant substances during pregnancy. However, a study conducted in a hospital in Finland from 1997-2002 concluded that there was no statistically significant correlation between antioxidant intake and diabetes risk.[36] This study involved monitoring of food intake through questionnaires, and estimated antioxidant intake on this basis, rather than by exact measurements or use of supplements.

THANK YOU