

Course: Immunology

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Lecture: Immune-Tolerance, Immunodeficiency and Autoimmunity.

Immunodeficiency

It is the disability of the immune system to fight infectious diseases and cancers, peoples with immune deficiency are called immune deficient or immune-compromised or immune-suppressed. These people are easy to get opportunistic infections which occur more severely than other peoples with normal immune system, e.g. flu virus can kill human with immune deficiency.

Types of Immune-deficiency:

1. Primary Immune deficiency:

Primary immunodeficiency cases are inherited defects of the immune system. These defects may be in the specific or nonspecific immune mechanisms. They are classified on the basis of the site of lesion in the developmental or differentiation pathway of the immune system. Individuals with immunodeficiencies are susceptible to a variety of infections and the type of infection depends on the primary site of immunodeficiency (Table 1).

2. Secondary Immune deficiency:

This type of immunodeficiency occurs due to external factors and not inherited. Factors that cause this type of immune deficiency are:

a) Infections that cause Immune deficiency:

The most common example is acquired immunodeficiency syndrome (AIDS). Secondary immunodeficiency which is caused by HIV virus. This virus infects T-cells and cause suppression of immune response. Also some other infections with viruses, bacteria, protozoa and helminthes can lead to this type immune deficiency.

b) Physiological diseases that cause Immune deficiency:

Some cancer types can cause immunodeficiency like Leukemia and Lymphoma. Also some physiological diseases can cause immunodeficiency like diabetes mellitus.

c) **Aging**: can cause Immune deficiency due to reduction in the size of thymus, a decrease in CD markers of immune cells.

d) **External and environmental factors**:

Like effects of immunosuppressive drugs, chemotherapy, radiation exposure and malnutrition or anemia.

Table 1. Characteristic infections of the primary immunodeficiencies

component	primary pathogen	primary site	clinical example
T-cells	intracellular, bacteria viruses, protozoa, fungi,	non-specific	SCID, DiGeorge
B-cells	Pneumococcus, Streptococcus, Haemophilus	lung, skin, CNS	IgG, IgM deficiency IgG, IgM deficiency
	Enteric bacteria and viruses	GT, nasal, eye	IgA deficiency
phagocytes	Staphylococcal, Klebsiella Pseudomonas,	lung, skin, lymph node	chronic granulomatous disease (CGD)
complement	Neisseria, Haemophilus, Pneumococcus, Streptococcus	CNS, lung and skin	C3 components deficiency

Immune-Tolerance

Tolerance is the specific immunological non-reactivity to an antigen, the most important form of tolerance is non-reactivity to self-antigens, it is possible to induce tolerance to non-self-antigens. When an antigen induces tolerance, it is called tolerogen.

There are many mechanisms for self-antigen tolerance like T-suppressor cells, receptor editing, Clonal ignorance and Clonal deletion. Sometime human body needs for induction of tolerance to non-self-antigens like in the cases of tissues or organs transplantation, e.g. kidneys transplantation and bone marrow grafting.

Autoimmunity

Defined as an immune response against the human own antigens of the body due to breakdown of self-tolerance or immune-tolerance to the self-Antigens, that will cause many diseases called Autoimmune diseases. Scientists suggest the genetic susceptibility for autoimmune diseases.

Many mechanisms are involved in autoimmunity diseases; Cross reactive antigens may lead to autoimmunity, Antigens on some pathogens have cross reactive determinants which with self-antigens and any immune response against these determinants may lead to reaction against the antigens of the body. For example, Post streptococcal nephritis and carditis, antibodies during syphilis and association between *Klebsiella* and ankylosing spondylitis are examples of autoimmunity due to cross reactivity. While sometimes the body forms antibodies against its own Antigens like the autoimmune disease of Systemic Lupus Erythematosus (SLE) when Auto-antibodies are formed against the body antigens and attack organs and tissues.