Course Name: Physiology

Topic: IMMUNE TOLERANCE

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Immune tolerance may be defined as a state of unresponsiveness to an antigen. It occurs in two forms: natural and acquired.

1. Natural tolerance refers to the non-responsiveness to a self-antigen. During embryonic development, when immune system is immature, any antigen which comes in contact with the immature immune system is recognized as a self-antigen. Therefore, it does not evoke any response in later life when body is exposed to the same antigen.
2. Acquired tolerance means unresponsiveness to a potential antigen. It results due to impairment of immune system, hence there is lack of responsiveness to the potential antigens.
Tolerance to fetus
Fetus is genetically different from the mother and thus it should evoke an immune response in the mother. However, it usually never happens, and it is considered to be the best example of immune tolerance.
AUTOIMMUNITY During fetal life, when many antigens are presented to immune system, they are recognized as self-antigens and antibodies, and cytotoxic T cells are not produced. Therefore, tolerance to self-antigen is produced. However, sometimes body starts producing antibodies or T cells against self-antigen (own cells or tissue) leading to an autoimmune disease. Therefore, autoimmunity may be defined as immune response to self-antigen
Autoimmune diseases

Common autoimmune diseases include the following:

Haemolytic anaemia. Antibodies react with its own RBCs.

Pernicious anaemia. Antibodies react against gastric mucosa.

Thrombocytopenic purpura. Autoantibodies react with self-platelets.

Graves’ disease. Autoantibodies bind to the thyroid cells and stimulate them.

Insulin-dependent diabetes mellitus. Antibodies damage the β cells (insulin-producing cells) of the pancreas.

Rheumatoid arthritis. Antibodies damage the joints
HYPERSENSITIVITY

Hypersensitivity is an abnormal response which produces physiological or histopathological damage in the host. There are four types of hypersensitivity reactions:

Type I (anaphylaxis or IgE mediated)
Type II (antibody-mediated cytotoxicity)
Type III (immune complex-mediated disorders)
Type IV (delayed type or T cell-mediated hypersensitivity)
Type I

Time of onset of reaction 1/2–8 h
Reaction mediators IgE, histamine, serotonin
Passive transfer with Serum
Examples Anaphylaxis, Asthma
Type II

Time of onset of reaction 5–12 h
Reaction mediators IgG, IgM and complement
Passive transfer with serum
Examples Transfusion reactions (incompatibility reaction)
Hemolytic disease of newborn
Drug induced allergies
Type III

Time of onset of reaction 3–8 h

Reaction mediators IgG, IgM, neutrophils, eosinophils, lysosomal enzymes

Passive transfer with serum

Examples  Serum sickness
Type IV

Time of onset of reaction 24–48h
Reactions mediated by T lymphocytes and macrophages, lymphokines
Passive transfer with T cell
Examples: Tuberculin test
Contact dermatitis
Graft rejection
IMMUNODEFICIENCY DISEASES

Immunodeficiency diseases occur when the body defence mechanisms are impaired.

Immunodeficiency diseases may be classified as primary or secondary.

Primary immunodeficiency

Primary immunodeficiency occurs due to defect in the development of the immune system. X-linked agammaglobulinaemia also known as Bruton’s disease.
Secondary immunodeficiency disease

Acquired deficiencies of immunological response mechanisms can occur secondarily to number of diseases. Secondary immunodeficiency is more common than the primary immunodeficiency. Acquired immune deficiency syndrome (AIDS) is the most important
• Acquired immune deficiency syndrome AIDS is acquired immune deficiency syndrome is characterized by reduction in the number of TH cells because of infection by human immunodeficiency virus (HIV).