Immunodeficiency

Introduction

- Immunodeficiency results from a failure or absence of elements of the immune system, including lymphocytes, phagocytes, and the complement system.
- It can be primary or secondary (acquired).

Primary immunodeficiency

- Primary immunodeficiency disorder (PID) refers to a large heterogeneous group of disorders that result from defects in immune system development and/or function.

- PIDs are broadly classified as disorders of adaptive immunity (i.e., **T cell, B-cell or combined immunodeficiencies**) or of innate immunity (e.g., **phagocyte and complement disorders**).

Primary B Cell Immunodeficiency

- Primary B-cell immunodeficiencies refer to diseases resulting from impaired antibody production due to either molecular defects intrinsic to B-cells or a failure of interaction between B-cells and T-cells.
- X- linked Agammaglobulinemic (Bruton's Disease)
- Selective IgA Deficiency

X- linked Agammaglobulinemia (Bruton's Disease)

- This deficiency is characterized by a failure of B cells to mature beyond the pre-B cell stage and the consequent inability to produce all classes of immunoglobulins.
- The inherited defect is mapped to the gene encoding Bruton's tyrosine kinase (Btk), located on the long arm of the X chromosome.
- Increased susceptibility to encapsulated recurrent pyogenic bacteria(*S. pneumonia* and *Pseudomonas* species).
- Skin infections (group A streptococci and *S. aureus*).
- Persistent viral or parasitic infections.

Selective IgA Deficiency

- The defect in IgA deficiency is related to the inability of IgA B cells to undergo normal differentiation to the plasma-cell stage.
- IgG2 and IgG4 may also be deficient in IgA-deficient patients.
- Patients of IgA-D are susceptible to allergic conjunctivitis, urticaria, asthma, various gastrointestinal diseases(food allergy), autoimmune and neurological diseases.

Severe Combined Immunodeficiency Disease (SCID)

- The family of disorders termed SCID stems from defects in lymphoid development that affect either T cells or both T and B cells.
- The thymus does not develop, and the few circulating T cells in the SCID patient do not respond to stimulation by mitogens, indicating that they cannot proliferate in response to antigens.
- SCID results in severe recurrent infections and is usually fatal in the early years of life.

T cell Immunodeficiency

- Patients are evaluated for T-cell deficiency by enumerating peripheral blood T-cell subsets and natural killer (NK) cells by flow cytometry; in addition, lymphocyte proliferative responses to mitogens and specific antigens can be assessed in vitro.

- Primary T cell immunodeficiencies include diseases like DiGeorge Syndrome, Ataxia Telangiectasia, Wiskott-Aldrich Syndrome etc.

Di George Syndrome (Thymic Aplasia)

- The syndrome was first described in 1968 by American physician Angelo DiGeorge resulting from the abnormal development of the 3rd and 4th pharyngeal pouches during embryonic life.
- Tetany is present.
- Fungal and viral infections are common.
- A transplant of the fetal thymus is needed to correct this deficiency.

Ataxia Telangiectasia

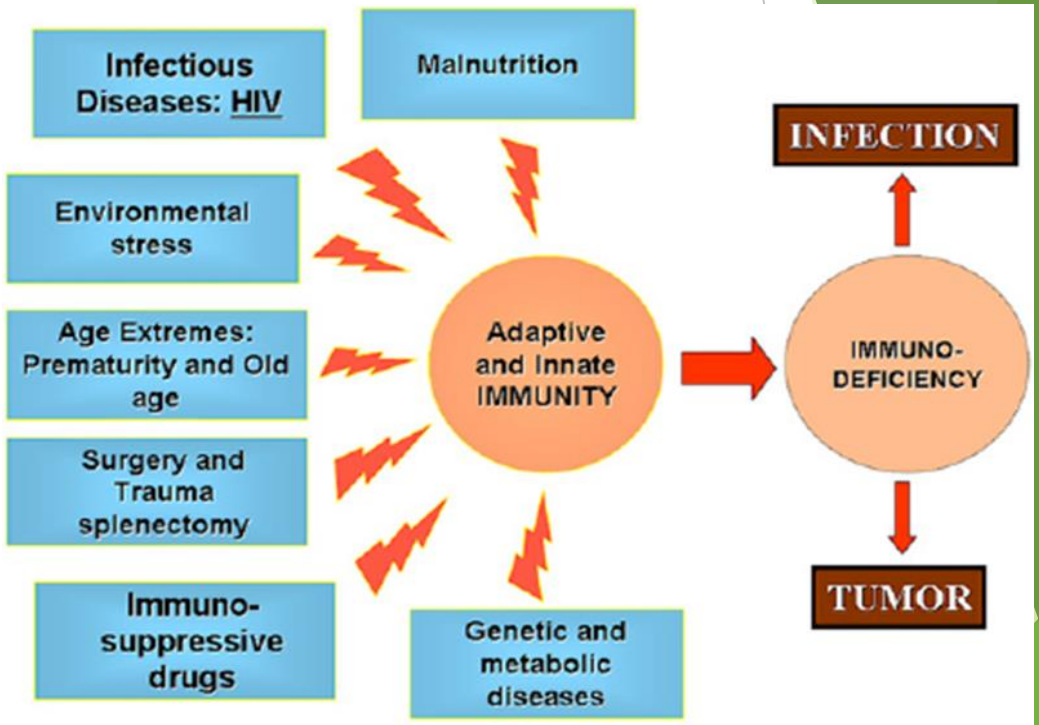
- Ataxia telangiectasia is a disease syndrome that includes deficiency of IgA and sometimes of IgE.
- The syndrome is characterized by difficulty in maintaining balance (ataxia) and by the appearance of broken capillaries (telangiectasia) in the eyes.
- T-cells and their functions are diminished to various degrees.
- B-cell numbers and IgM concentrations are normal to low.
- IgG is often reduced, and IgA is considerably reduced.
- There is a high incidence of malignancy, especially leukemias, in these patients.

Wiskott-Aldrich Syndrome

- Wiskott-Aldrich syndrome was first described in 1937 by Dr. Alfred Wiskott, a German pediatrician who identified three brothers with low platelet counts (thrombocytopenia), bloody diarrhea, skin rash (eczema) and recurrent ear infections.
- This syndrome is associated with normal T-cell numbers with reduced functions, which get progressively worse.
- IgM concentrations are reduced, but IgG levels are normal.
- Both IgA and IgE levels are elevated.
- These patients have a defective WASP, which is involved in actin filament assembly.

Secondary Immunodeficiency

- Extrinsic factors can adversely affect immune responses, producing states of secondary immunodeficiency and consequent increased risk of infections.



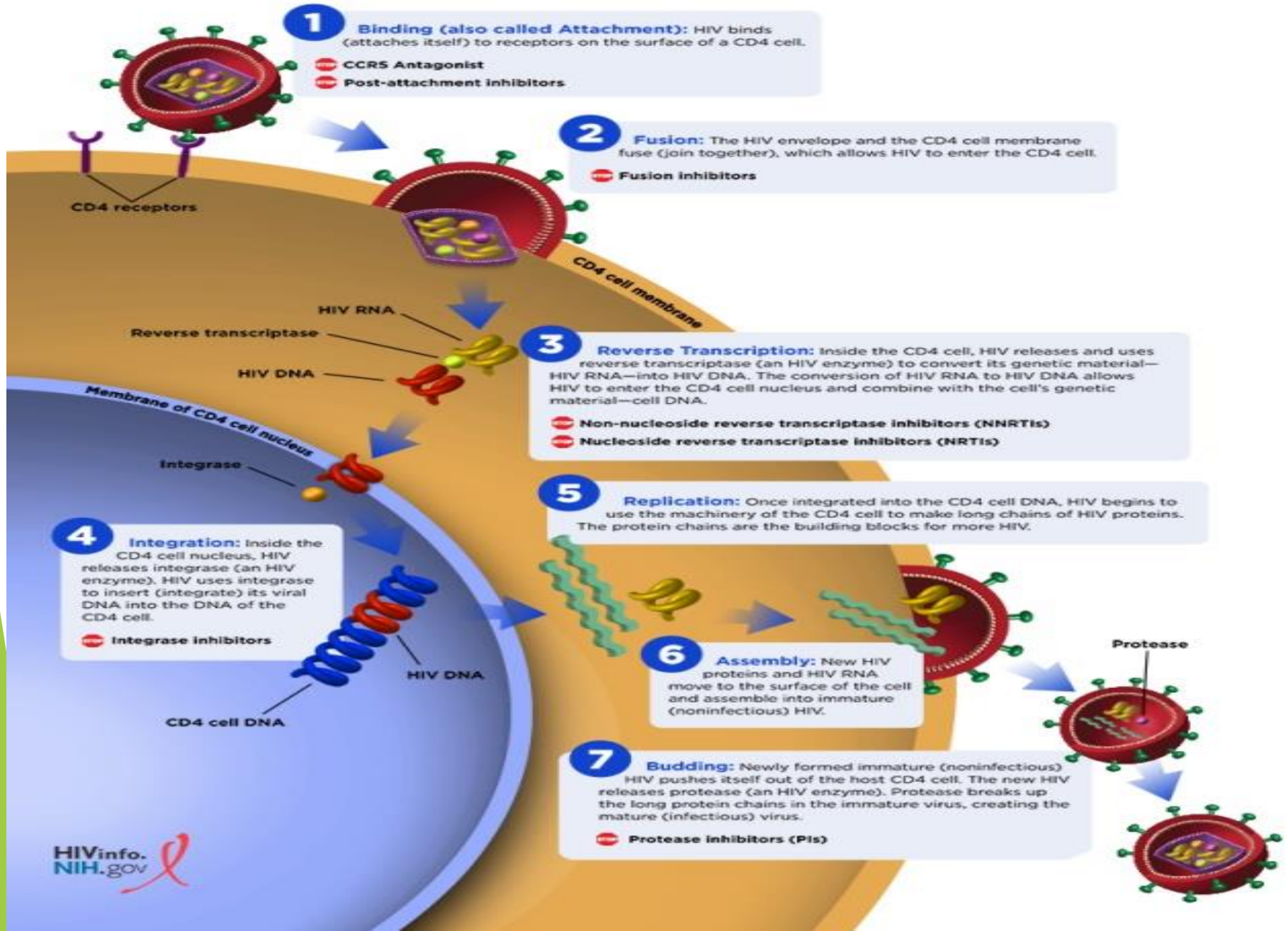
Acquired Immunodeficiency Syndrome(AIDS)

- Françoise Barré-Sinoussi and Luc Montagnier identified the human immunodeficiency virus (HIV) that causes AIDS in 1983, while working at the Pasteur Institute in Paris. They originally called it lymphadenopathy associated virus (LAV).
- HIV also known as human immunodeficiency virus is a retrovirus.
- Immune dysfunction results from the direct effects of HIV and the impairment of CD4 T cells.
- HIV proteins may act as super antigens.

- There are decreased responses to antigens and mitogens.
- Interleukin-2 and other cytokines are decreased.
- Infected cells may be killed by HIV-1 specific CD8+ T cells.
- In HIV-1 infection, neutralizing antibodies appear to be ineffective in controlling viral replication and infection.

The HIV Life Cycle

HIV medicines in seven drug classes stop (⛔) HIV at different stages in the HIV life cycle.



Treatment

- HIV treatment involves taking medicine that reduces the amount of HIV in your body.
- HIV medicine is called antiretroviral therapy (ART).
- There is no effective cure for HIV. But with proper medical care, you can control HIV.
- Most people can get the virus under control within six months.
- Taking HIV medicine does not prevent transmission of other sexually transmitted diseases.

References

- www.ncbi.nlm.nih.gov
- Immunology kuby 5th edition
- www.sciencedirect.com
- www.elsevier.com
- Cellular and Molecular Immunology

Thank You