

ADAPTIVE IMMUNITY

ALEENA P N
ROLL NO:10
2023 BATCH

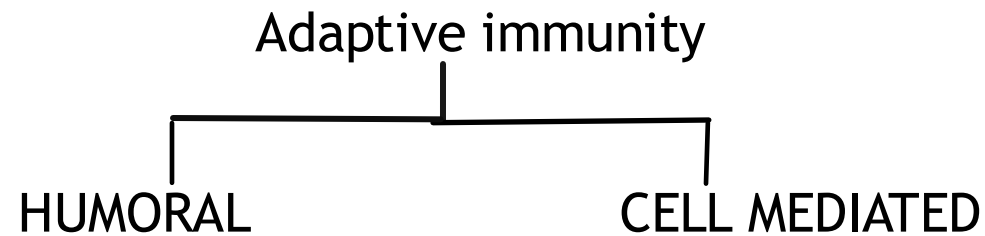
ADAPTIVE IMMUNITY

- ▶ Specific or Adaptive immunity is directed specifically against an invading pathogen
- ▶ FUNCTIONS:
- ▶ Recognition of self from non self antigen
- ▶ Mount a specific response against non self agent and eliminate the agent of infected cell
- ▶ Development of immunological memory
- ▶ Secretion of Immunoglobulins by B lymphocyte and plasma cells which act as antibodies against antigenic substance.

ADAPTIVE IMMUNITY

The adaptive immune system consists of lymphocytes and their products including antibodies .

- ▶ There are two types of adaptive immunity



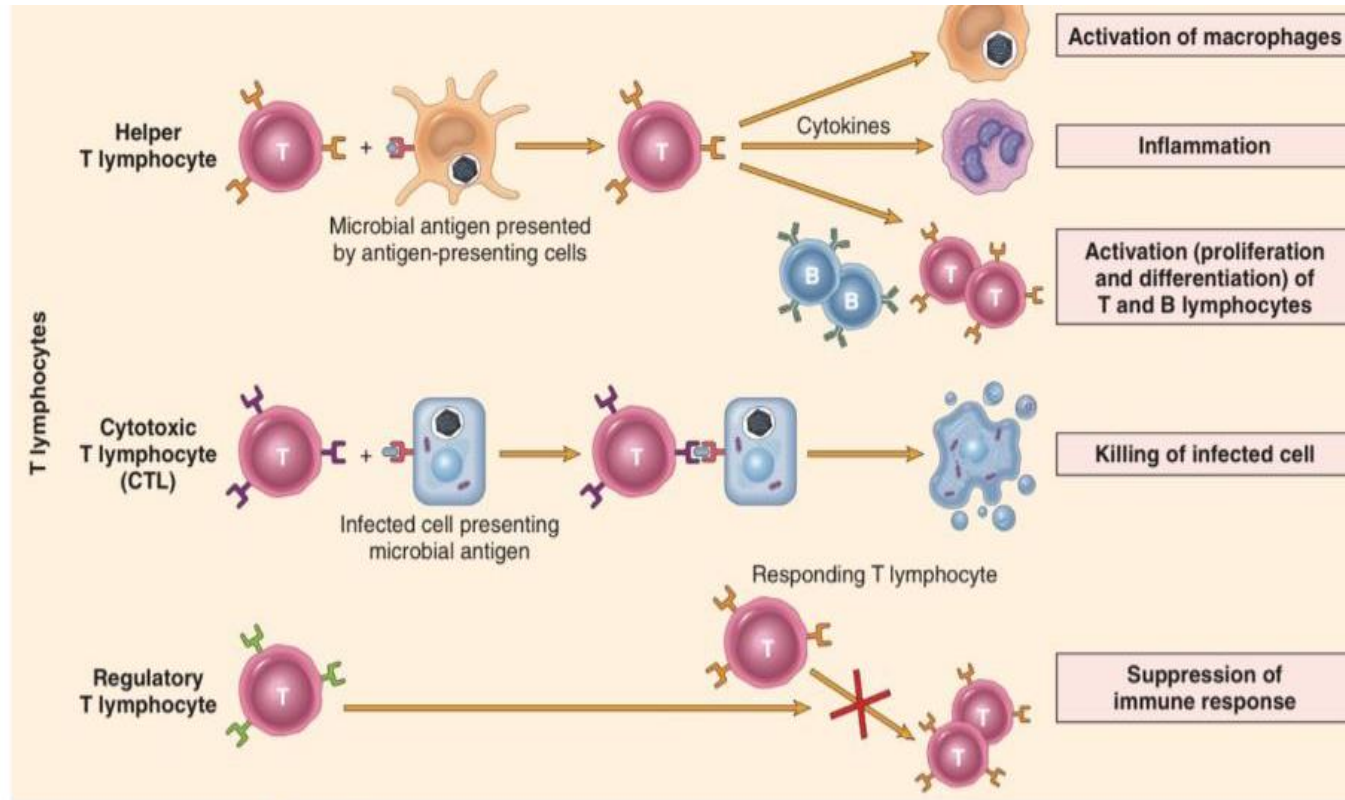
HUMORAL IMMUNITY- Protects against extracellular microbes and their toxins.
Mediated by B lymphocytes and their secreted products,
antibodies.

CELLULAR IMMUNITY- Defence against intracellular microbes and against cancers
Mediated by T Lymphocytes

Both classes of lymphocytes express highly specific receptors for a wide variety
of substances which are called antigens

T Lymphocyte

- ▶ 3 Major population of T cell
- ▶ Helper T lymphocyte - Stimulate B lymphocyte to make antibody and activate other leukocytes to destroy microbes
- ▶ Cytotoxic T lymphocyte -Kill infected cells
- ▶ Regulatory T lymphocyte-Limit immune responses and prevent reactions against self antigens



T cell activation

- ▶ T Cells recognizes specific cell bound antigen by means of an antigen specific TCR
- ▶ TCR- Disulfide linked heterodimer made of alpha and beta polypeptide chain
- ▶ Each subunit have two regions
- ▶ Variable and constant
- ▶ The alpha beta TCR Recognizes peptide antigens that are presented by MHC molecules on surface of APC
- ▶ By limiting the specificity of T cells displayed by the cell surface MHC molecules called MHC restriction ,the immune system ensures that T cells see only cell associated antigens

- ▶ Each TCR -Non covalently linked to 6 polypeptide chains forms CD-3 complex and side dimer
- ▶ Involved in transduction of signals into T cells that are triggered by binding of antigen to TCR
- ▶ T cell also expresses CD4 ,CD8 and integrins
- ▶ CD4-function as cytokine secreting helper T cells that assist macrophages and B lymphocyte to combat infections
- ▶ CD8 -function as cytotoxic T lymphocytes to destroy host cells harbouring microbes
- ▶ CD4 and CD8 act as co receptors in T cell activation
- ▶ CD4 molecule bind to class 2 MHC
- ▶ CD8 molecules bind to class 1 MHC

- ▶ To respond to ,T cells have to recognize not only antigen -MHC complex but also additional signals produced by CD 28
- ▶ Integrins are adhesion molecules that promote the attachment of T cells to antigen presenting cell

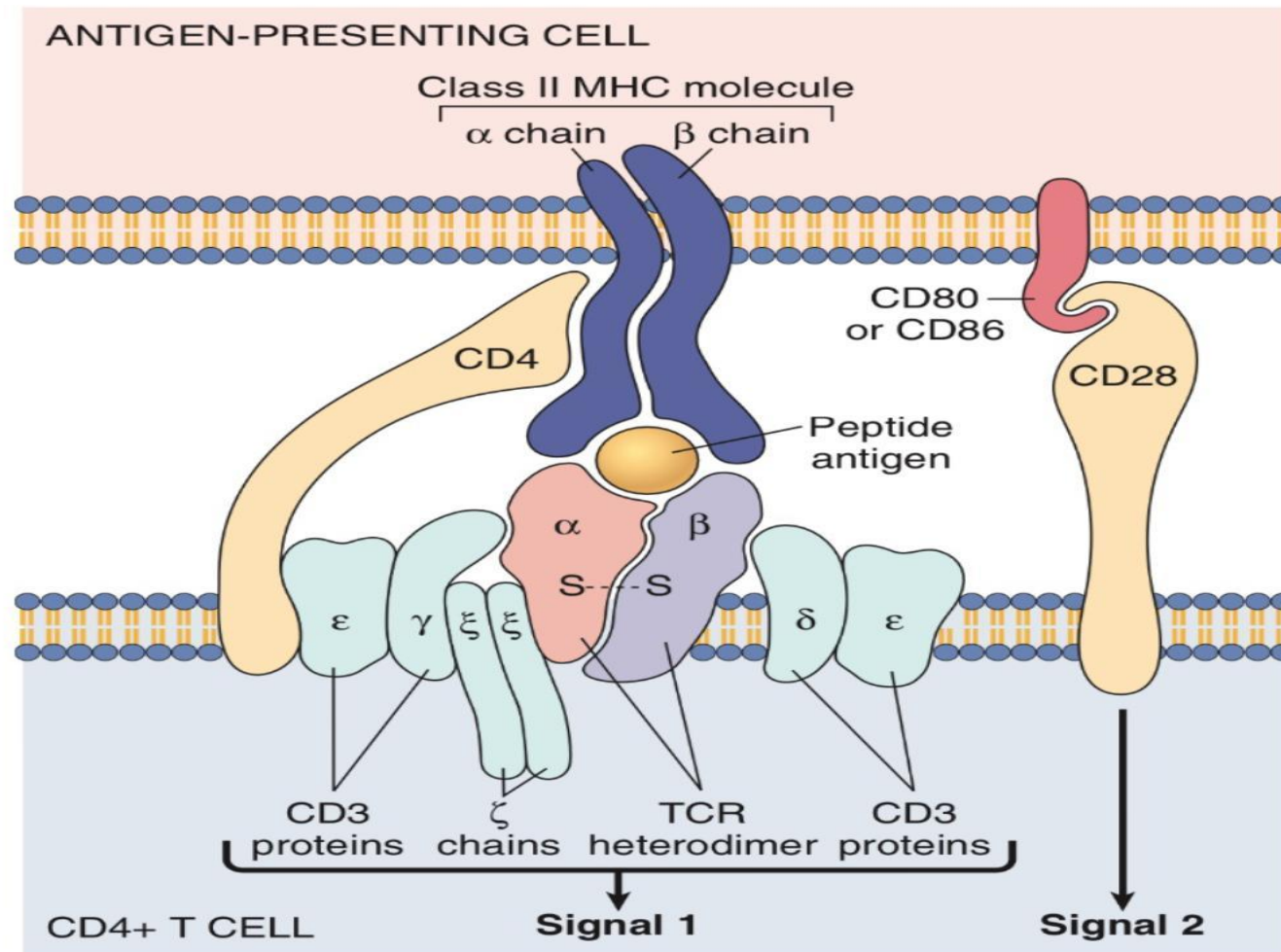


Fig. 5.5 The T-cell receptor (TCR) complex and other molecules involved in T-cell activation. The TCR heterodimer, consisting of an α chain and a β chain, recognizes antigen (in the form of peptide-MHC complexes expressed on antigen-presenting cells), and the linked CD3 complex and ζ chains initiate activating signals. CD4 and CD28 are also involved in T-cell activation. (Note that some T cells express CD8 and not CD4; these molecules serve analogous roles.) The sizes of the molecules are not drawn to scale. *MHC*, Major histocompatibility complex.

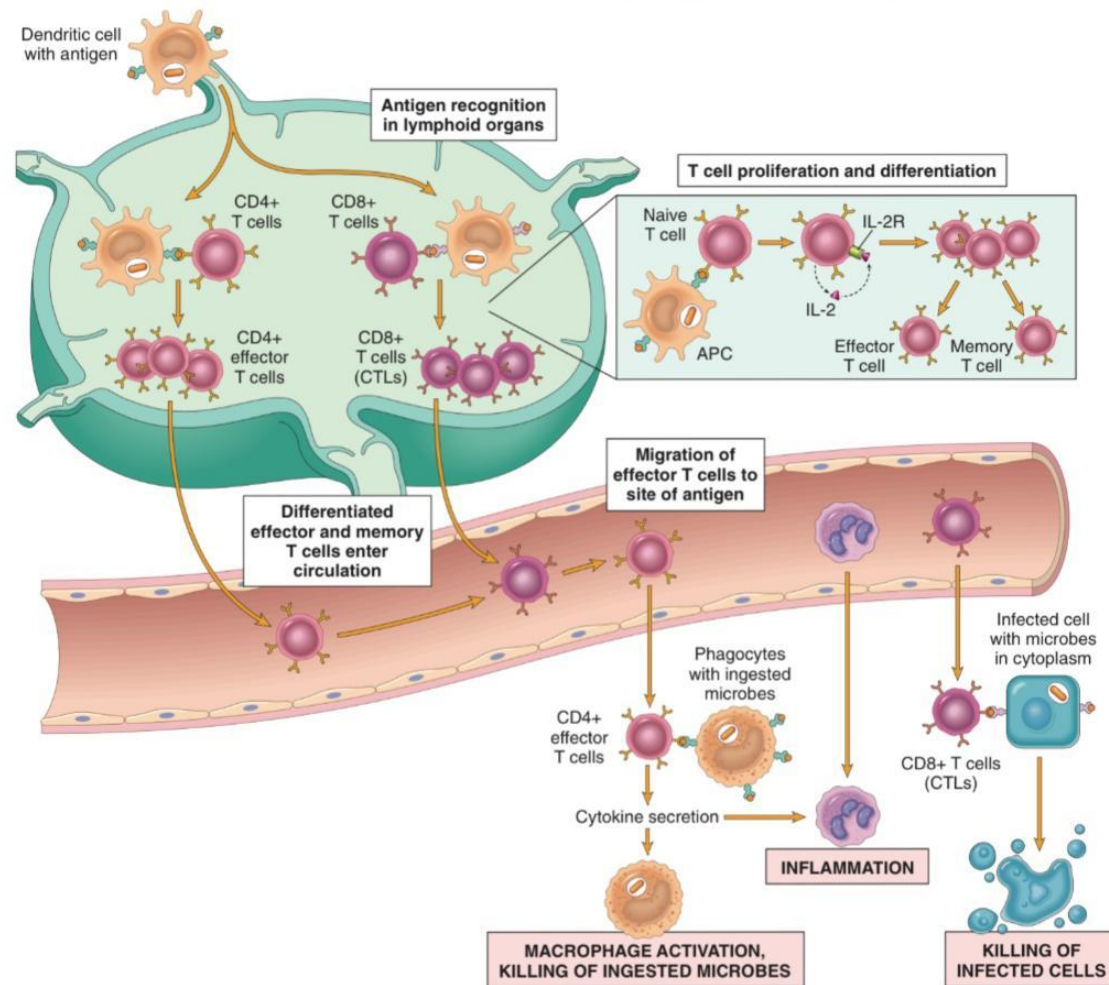
B lymphocyte

- ▶ B lymphocytes are the only cells in the body capable of producing antibodies
- ▶ Develop from precursors in the bone marrow
- ▶ B cells binds via antigen receptor complex
- ▶ After antigenic stimulation the B cell is converted to plasma cell which secrete antibody
- ▶ Single plasma cell can secrete thousands of antibodies
- ▶ B cell also express several other molecules that are essential for their responses. These include the type 2 complement receptor (CR2 or CD21), which recognizes complement products generated during innate immune responses to microbes and CD40 , which receives signals from helper T cells

CELL MEDIATED IMMUNITY

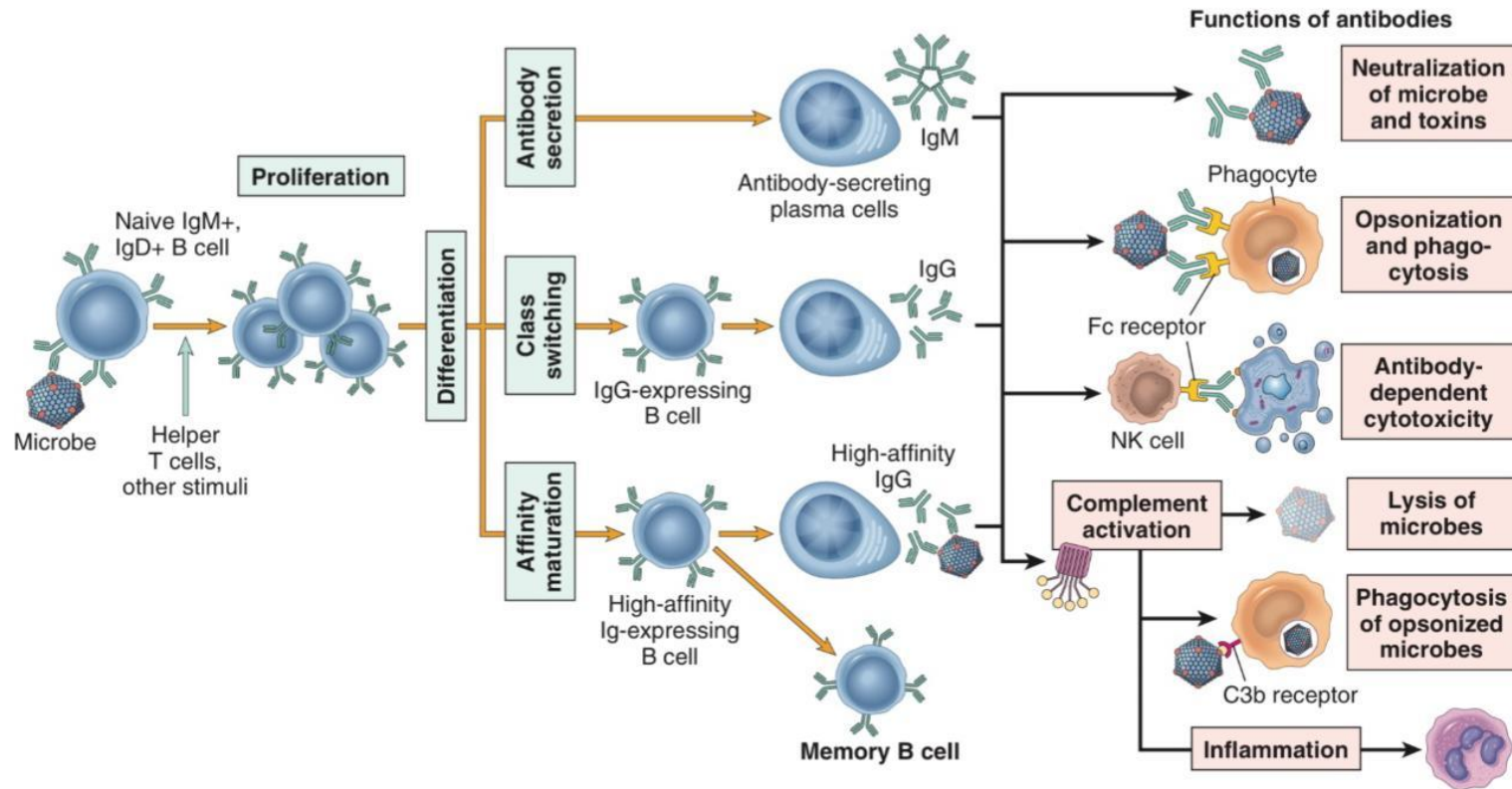
- ▶ Dendritic cells capture microbial antigens from epithelia and tissues and transport the antigens to tissues
- ▶ During this process the dendritic cells mature and express high levels of MHC molecules and co stimulators
- ▶ Naïve T cells recognize MHC associated peptide antigens displayed on dendritic cells
- ▶ The T cells are activated to proliferate and to differentiate into effector and memory cells , which migrate to the sites of infection and serve various functions in cell mediated immunity.
- ▶ CD4 effector T cells recognize the antigens of microbes ingested by phagocytes and activate the phagocytes to kill the microbes.
- ▶ CD8 cytotoxic T lymphocyte kill infected cells harboring microbes in the cytoplasm

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- ▶ Some activated T cells remain in the lymphoid organs and help B cells to produce antibodies
 - ▶ Some T cells differentiated into long lived memory cells



HUMORAL IMMUNITY

- ▶ Naïve B lymphocytes recognize antigens and under the influence of helper T cells the B cells are activated to proliferate and to differentiate into antibody secreting plasma cells
- ▶ Some of the activated B cells undergo heavy chain class switching and affinity maturation and some become long lived memory cells .



REFERENCE

- ▶ Robbins basic pathology 10 th edition

THANK YOU