

CSIR NET Life Science Unit 4

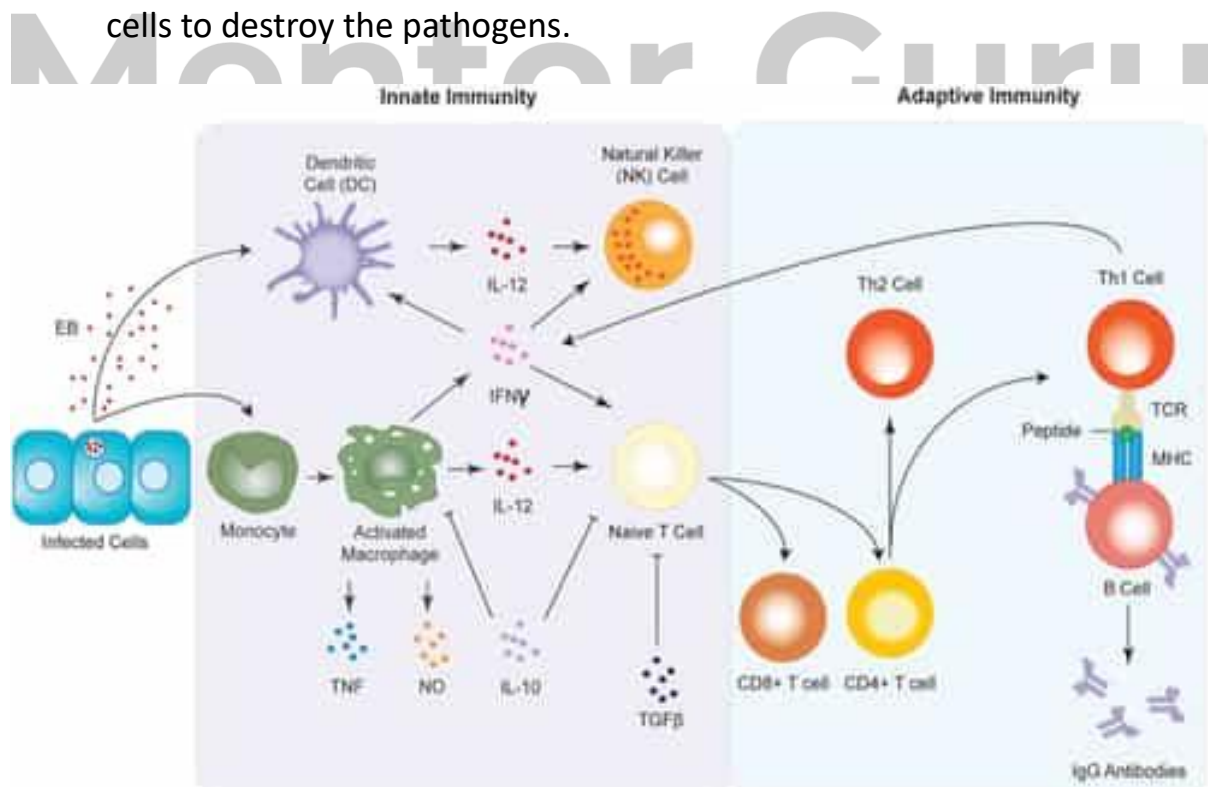
Adaptive and Innate Immune Response

Adaptive Immunity

- The adaptive immune response functions to destroy invading pathogens and relies on the capacity of immune cells to distinguish between the body's own cells and unwanted invaders.
- The adaptive immune system uses antigen-specific receptors on T and B Cells generated by gene rearrangements during development.
- These varying receptors produce an array of immune responses to pathogens and enhance the immune response to subsequent encounters with that pathogen through the formation of immunologic memory—i.e. “learning” from the initial encounter.

Cells of the adaptive immune system

- The adaptive immune response involves two types of responses: antibody and cell-mediated immune responses.
- In antibody responses, B Cells are activated to secrete antibodies which circulate in the bloodstream and permeate body fluids.
- B Cells then bind specifically to an antigen and mark pathogens for destruction, mainly by phagocytic cells of the innate immune system.
- In cell-mediated immune responses, activated T Cells kill host cells presenting foreign antigen on the cell surface or stimulate other immune cells to destroy the pathogens.



Adaptive Immune Signalling

- The binding of antigen to receptors on B and T lymphocytes are critical events in the generation of the adaptive immune response.
- Binding of antigen to the B cell antigen receptor (BCR) or activation of the T Cell receptor (TCR) by MHC mediated antigen presentation activates multiple signaling cascades in both B and T Cells, respectively.
- The complexity of the signaling within these pathways allows for multiple outcomes that determine cell fate and the nature of the adaptive immune response.

Innate Immunity

- Innate immunity provides a general immune response, meaning it is not specific to a particular pathogen; any foreign body or non-self molecule is a target.
- The innate immune system includes physical barriers such as the skin and other epithelial surfaces that act as the first line of defense.
- However, when epithelial barriers are breached, other components of the innate immune response detect pathogens via germline-encoded pattern recognition receptors, leading to a rapid immune response (within minutes to hours).

Cells of the Innate Immune System

- During hematopoiesis, the common myeloid progenitor (CMP) cell gives rise to the myeloid lineage which includes most of the component cells of the innate immune response.
- CMP cells are a precursor to monocytes, which differentiate into macrophages and dendritic cells, and also cells of the granulocyte lineage, which includes mast cells, neutrophils, eosinophils and basophils.
- In contrast, cytotoxic natural killer (NK) cells are a component of the innate immune response derived from common lymphocyte progenitor (CLP) cells

Innate Immune Signalling

- Most cell types not specific to the immune system can harbour intrinsic innate immune functions in the form of cytoplasmic receptors and signalling and effector molecules.
- **Signalling pathways active in the innate immune response include:**

- Sting signalling pathway, which induces type I interferon production when cytosolic DNA sensors detect infection by intracellular pathogens, such as viruses, mycobacteria and intracellular parasites.
- Toll-like receptor signalling, which activates immune cell responses when cell surface TLRs detect distinct pathogen-associated molecular patterns.
- CST is the leader in the production of validated antibodies for the characterization of intracellular signaling pathways and offers numerous antibodies directed against components of the STING, TLR, and inflammasome pathways

