



FACULTY OF ENGINEERING & TECHNOLOGY

**UNIT- I**  
**Topic: T- Cells and its types.**



# Introduction to T- lymphocytes

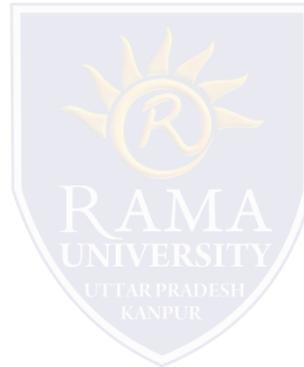
## T-lymphocytes :

- It's a type of lymphocyte (a subtype of white blood cell) that plays a central role in cell-mediated immunity.
- t-cells can be distinguished from other lymphocytes by the presence of a T-cell receptor on the cell surface.
- They are called T cells because they mature in the thymus gland.
- The main job of T-cells is to fight infection.
- There are a number of different types of T-cells that act in many ways to identify, directly attack and destroy infectious agents.
- Along with other WBCs, they play a major role in the immune system, which guards the body against infection

# Types Of T-cells

## Types of T-cells:

1. T-helper cells (Th cells)
2. Cytotoxic T-cells (Tc cells)
3. Memory T-cells
4. Regulatory T-cells (treg)



| Name of T Cell Subset | Functions  |
|-----------------------|--|
| Helper T Cell         | assist other white blood cells in immunologic processes.   |
| Cytotoxic T Cell      | destroy virally infected cells and tumor cells.  |
| Memory T Cell         | subset of infection- as well as potentially cancer-fighting T cells.   |
| Regulatory T Cell     | Regulatory T cells actively suppress activation of the immune system and prevent pathological self-reactivity. |

# Helper T cells

There are two different kinds of helper T cells. Th1 and Th2. Th1 functions to empower macrophages so that they can destroy intravesicular pathogens (bacteria).

This is done by two signals. Binding of CD40L from Th1 to CD40LR on the macrophage and by interferon gamma released from Th1.

Th2 cells function to activate B cells. Normally it is insufficient for an antigen alone to stimulate the B cell to activation. The Th2 cell when activated will bind to the B cell (CD40L and CD40LR) and release cytokines

# Functions

- **Helper T cell**
- T helper cell ( $T_H$  cells) assist other white blood cells in immunologic processes, including maturation of B cells into plasma cells and memory B cells, and activation of cytotoxic T cells and macrophages. These cells are also known as **CD4<sup>+</sup> T cells** because they express the CD4 glycoprotein on their surface.

# Cytotoxic T

Cytotoxic T (or CD8) cells are activated in your lymph nodes by dendritic cells. Once activated they are sent out to the site of infection and they bind to the cells that express the MHC class I that are presenting the foreign antigen. They will then release perforin (punch holes in the infected cell) and granzymes (induces apoptosis). The infected cells are now destroyed.

# Functions

- **Cytotoxic**
- **Cytotoxic T cells** ( $T_C$  cells, or CTLs) destroy virally infected cells and tumor cells, and are also implicated in transplant rejection. These cells are also known as **CD8<sup>+</sup> T cells** since they express the CD8 glycoprotein at their surface.

### Memory T cells

- **Memory T cells** are a subset of antigen-specific T cells that persist long-term after an infection has resolved. They quickly expand to large numbers of effector T cells upon re-exposure to their cognate antigen, thus providing the immune system with "memory" against past infections. Memory T cells comprise two subtypes: central memory T cells ( $T_{CM}$  cells) and effector memory T cells ( $T_{EM}$  cells). Memory cells may be either  $CD4^+$  or  $CD8^+$ . Memory T cells typically express the cell surface protein CD45RO.

# Functions

**Memory T cells** are a subset of infection- as well as potentially cancer-fighting T cells.

Such T cells can recognize foreign invaders, such as bacteria or viruses, as well as cancer cells.

memory T cells can reproduce to mount a faster and stronger immune response than the first time the immune system responded to the invader.

# Regulatory T cells

- **Regulatory**
- **Regulatory T cells** ( $T_{reg}$  cells), formerly known as **suppressor T cells**, are crucial for the maintenance of immunological tolerance. Their major role is to shut down T cell-mediated immunity toward the end of an immune reaction and to suppress auto-reactive T cells that escaped the process of negative selection in the thymus.
- Two major classes of  $CD4^+$   $T_{reg}$  cells have been described — naturally occurring  $T_{reg}$  cells and adaptive  $T_{reg}$  cells.

# Functions

To function properly, the immune system must discriminate between self and non-self. When self/non-self discrimination fails, the immune system destroys cells and tissues of the body and as a result causes autoimmune diseases.

Regulatory T cells actively suppress activation of the immune system and prevent pathological self-reactivity, i.e. autoimmune disease.