

# Difference Between CD4 Cells and CD8 Cells

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## Key Difference – CD4 Cells vs CD8 Cells

In the context of [cell-mediated immunity](#), [T cells](#), generally referred to [T lymphocytes](#), play an important role. Since they mature in the [thymus](#) from thymocytes, they are referred to as T cells. T cells have two main categories: [T helper \(Th\) cells](#) and [cytotoxic T cells \(Tc\)](#). Due to the presence of two different types of [glycoproteins](#), i.e., CD4 and CD8, on the cell surface of Th cells and Tc cells, they are referred to as CD4+ T cells and CD8+ T cells, respectively. **CD4+ T cells recognize antigens presented by Major Histocompatibility Complex (MHC) Class II and activate in order to kill intracellular microorganisms by releasing cytokines. CD8+ T cells only recognize [antigens](#) presented by MHC Class I and destroy infecting tumor cells and viruses directly.** This is the key difference between CD4 cells and CD8 cells.

## What are CD4 Cells?

CD4 is considered as a glycoprotein which plays a major role in the immune system. CD4 lies on the surfaces of some immune cells like [dendritic cells](#), T helper cells, [macrophages](#), and [monocytes](#). CD4 protein is usually encoded by a gene called CD4 gene in humans. CD4 possess a short cytoplasmic tail which consists of a special [amino acid](#) sequence which helps to initiate and communicate with tyrosine kinase Lck. This Lck is needed to activate the molecular components of the signaling cascade of a T cell which is activated. CD4 belongs to the [immunoglobulin](#) superfamily just as other cell surface receptors. It consists of four immunoglobulin domains D<sub>1</sub> to D<sub>4</sub>. These domains are situated on the extracellular surface of the respective cells. D<sub>1</sub> and D<sub>3</sub> are similar to immunoglobulin variable (IgV) domains while D<sub>2</sub> and D<sub>4</sub> are similar to the immunoglobulin constant (IgC) domains. CD4 interacts with  $\beta_2$ -domain of major histocompatibility complex (MHC) class II molecules with the help of D<sub>1</sub> domain. Therefore, these CD4 become specific for antigens which are presented only by MHC class II.

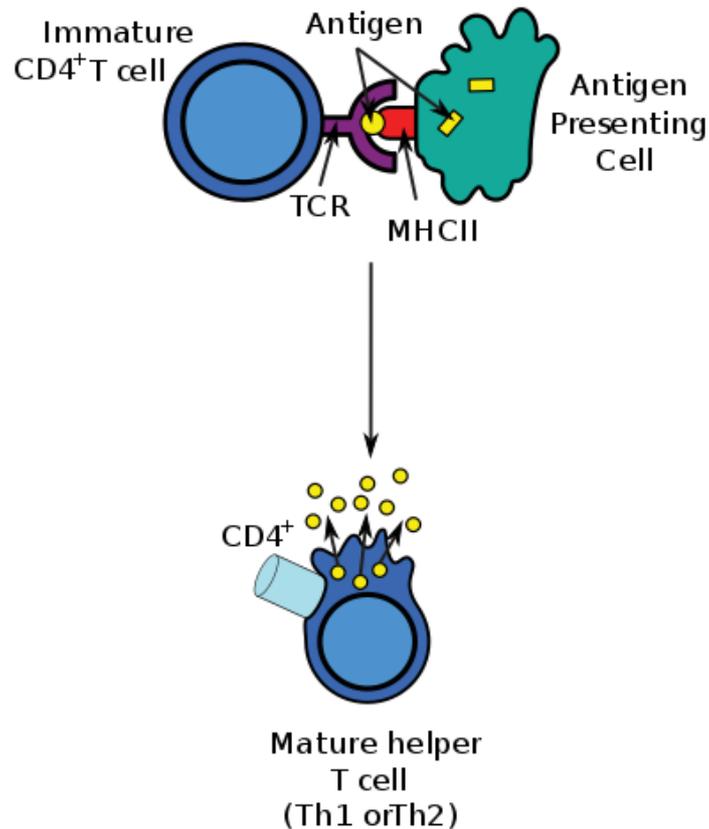


Figure 01: CD4 Cells

CD4 is known as a co-receptor of the T cell receptor (TCR). This helps in the communication with the antigen- presenting cells. CD4 and the TCR complex each bind to specific regions of the antigen-presenting cells with the influence of the extracellular D<sub>1</sub> domain. There are diseases which are caused due to defects of CD4. For example, in [HIV](#) infection, the HIV-1 virus enters the host T-cells through CD4, and the number of T cells which express CD4 are also subjected to a progressive reduction.

## What are CD8 Cells?

CD8 is considered as a transmembrane glycoprotein which functions in the immune system. CD8 is also known as a co-receptor of the T cell receptor (TCR). Similar to the TCR, CD8 binds to the major histocompatibility complex (MHC) class I protein specifically. The CD8 are mainly located on the surface of cytotoxic T cells and cortical thymocytes, natural killer cells, and dendritic cells. Just like CD4, CD8 also belongs to the immunoglobulin superfamily. In order to facilitate the function, the CD8 forms a dimer which consists of a CD8 chain pair. The common types of CD8 are CD8- $\alpha$  and CD8- $\beta$ . It consists of an immunoglobulin variable (IgV) like extracellular domain connecting to the membrane by a stalk and an intracellular tail. Normally, the IgV, like

extracellular domain of the type CD8- $\alpha$ , cooperates with the class I MHC molecules. This affinity between the molecules keeps the cytotoxic T cell's T cell receptor tightly bound together with the target cell during the activation of antigen specificity.

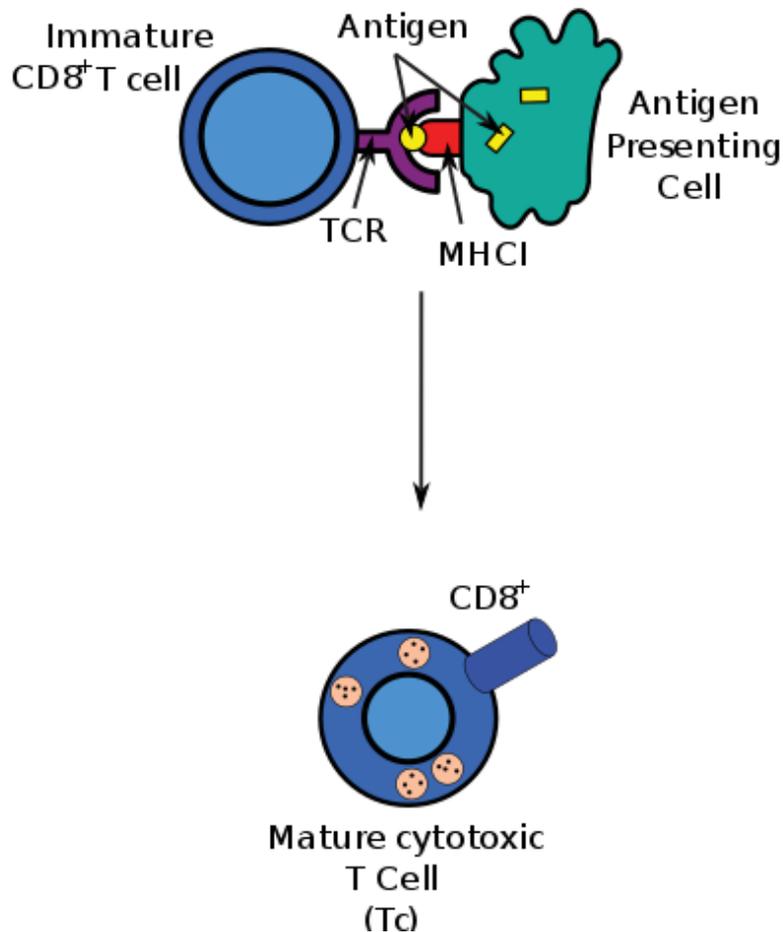


Figure 02: CD8 Cells

## What are the similarities between CD4 cells and CD8 cells?

- CD4 and CD8 are surface proteins which are found on the surface of their respective cells.

Both CD4 and CD8 are generated in the thymus and express the T-cell receptor.

- Both of them are considered as glycoproteins and belong to the immunoglobulin superfamily.

- Both are able to bind to MHC molecules in the absence of T cell receptor. CD4 and CD8 are also capable of improving the antigen-induced IL-2 production with different mechanisms.

## What is the difference between CD4 Cells and CD8 Cells?

CD4 Cells vs CD8 Cells	
CD4 are known as T helper cells.	CD8 are known as cytotoxic T cells.
Antigen Recognition	
CD4 cells recognize antigens presented by Major Histocompatibility Complex (MHC) Class II.	CD8 cells only recognize antigens presented by MHC Class I.
Mechanism of Action	
CD4 cells are situated on the surfaces of some immune cells like dendritic cells, T helper cells, macrophages, and monocytes.	Cellulose is a linear structure with linear $\beta$ glucose chains.
Mechanism of Action	
In CD4, Antigen presenting cells should be activated in order to kill intracellular microorganisms by releasing cytokines	In CD8, the infecting viruses and tumor cells are destroyed directly.
Function	
CD4 cells are responsible for the antigen presentation to B cells.	CD8 cells are responsible for indirect <a href="#">phagocytosis</a> .

## Summary – CD4 Cells vs CD8 Cells

T cells are important in cell-mediated immunity. They are matured in the thymus from thymocytes. T cells are distinguished from other lymphocytes due to the presence of T cell receptor. T cells are of two types: Th cells and Tc cells. The glycoproteins CD4 and CD8 are present on Th cells and Tc cells respectively. CD4+ T cells recognize antigens presented by Major Histocompatibility Complex (MHC) Class II and activate in order to kill intracellular microorganisms by releasing cytokines. CD8+ T cells only recognize antigens presented by MHC Class I and destroy infecting tumor cells and viruses directly. This is the difference between CD4 cells and CD8 cells.

## Reference:

1. "Adaptive immunity." Khan Academy, [Available here](#). Accessed 18 Sept. 2017.
2. "CD8 T Cells." British Society for Immunology, [Available here](#). Accessed 18 Sept. 2017.

## Image Courtesy:

1. "Antigen presentation" By user: [Sjef](#) – self made, referring to [this image](#). (CC BY-SA 3.0) via [Commons Wikimedia](#)

## How to Cite this Article?

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