

Cell-Mediated Response

by Sophia



WHAT'S COVERED

In this lesson, you will learn to identify characteristics of a cell-mediated immune response. Specifically, this lesson will cover:

1. Cell-Mediated Response

Recall that humoral response is the half of adaptive immunity that involves B cells producing antibodies. Some of these (like IgA and IgG) are secreted so they can float around the lymph. When they encounter a pathogen with the unique antigen they recognize, they can bind the pathogen and cause agglutination, for example, so the pathogen clumps instead of infecting our cells.

The antibodies that B cells produce can't enter a cell, so they can't combat a pathogen once that pathogen has infected one of our cells.

How does our body fight infection once it has entered our cells? **Cell-mediated immunity** is a response taken against a threat that has entered a cell.



TERM TO KNOW

Cell-Mediated Immunity

A type of adaptive immunity in which T cells respond to target cells that have been infected by pathogens.

2. The Process

Let's take a look at what is actually happening when a pathogen, such as a virus, infects our body.



STEP BY STEP

1. *A virus invades.*

Viruses are small, with only a few genes and a high rate of mutation. All of this means that there are lots of virus particles in the world, and new ones are arising every day. This is why it can be helpful to get a flu shot every year: Flu shots inoculate us against the most prevalent viruses that have arisen in the last 12 months.

2. *Dendritic cells engulf the virus.*

Dendritic cells are a type of phagocyte, so they will "eat" an invading virus particle and digest it. Our cells constantly recycle their macromolecules (like changing the oil in our cars), and bits of the recycled material are brought to the plasma membrane and displayed on the cell's surface via MHC markers. If the **MHC** displays typical cell material, the immune system knows the cell is healthy. But in this case, the dendritic cell has ingested a virus so that the MHC will display bits of viral protein on the cell's surface. The viral proteins are antigens that our immune system will recognize as foreign.

3. *Helper T cells monitor the dendritic cells.*

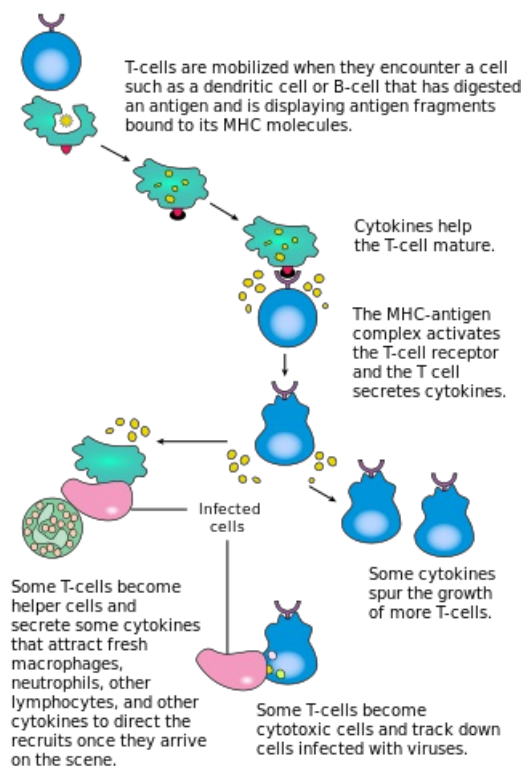
Remember that each T cell has a unique, randomly-generated antibody. T cells are going to come up to the infected dendritic cell's MHC complex and see if the antigen presented fits a particular T cell's antibodies. Different **helper T cells** have different receptors, and, if it doesn't fit, another will try. The helper T cell with the proper receptor will bind to that MHC containing that virus particle and activate the helper T cell.

4. *The correct helper T cell is activated.*

When the T cell with the antibody that matches the viral antigen presented by the dendritic cell's MHC, antibody and antigen bind like a lock and key, and the helper T cell becomes activated. It will then start to make copies of itself. Those copies will start to differentiate or specialize into different types of cells.

5. *The cell-mediated immune response multiplies.*

The activated T cell's daughters can specialize into something called effector helper T cells. These release cytokines, which activate **cytotoxic T cells**. Cytotoxic T cells can infect cells to undergo programmed cell death, a process known as **apoptosis**. Cytotoxic T cells can differentiate also into either memory cells or effector cells. Memory cells are a type of cell that will protect the body in the future if it is exposed to this particular pathogen again.



TERMS TO KNOW

MHC

Also known as major histocompatibility complex, MHCs are cellular markers on the plasma membrane that play an important role in mediating adaptive immunity.

Helper T Cells

A type of T cell that works to boost adaptive immune responses.

Cytotoxic T cells

A type of T cell that works to kill target cells.

Apoptosis

Programmed death of a cell which can be caused by chemicals that T cells release.



SUMMARY

Cell-mediated response is the immunity that takes effect when a pathogen has entered a cell. It involves helper T cell and cytotoxic T cells. **The process** involves the dendritic cells engulfing a pathogen like a virus and present its antigens on its MHC. From there, helper T cells will try to bind to the virus. Once one helper T cell attaches, it will activate. From there, it will replicate and specialize. Effector cells will release particles that will activate the cytotoxic T cell. These will cause apoptosis of cells infected by a pathogen. The cytotoxic T cells can also specialize into more effector cells and memory cells.

Keep up the learning and have a great day!



ATTRIBUTIONS

- [Cell-Mediated Response](#) | Author: Wikipeda | License: Public Domain



TERMS TO KNOW

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A type of adaptive immunity in which T cells respond to target cells that have been infected by pathogens.

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