

Organ Transplant and Immunotherapy

by Sophia



WHAT'S COVERED

In this lesson, you will learn to determine why a person's body might either accept or reject a transplanted tissue or organ. Specifically, this lesson will cover:

1. Organ Transplants

An organ transplant is a common practice in the medical field and can involve the transplant of various types of body organs. Sometimes, these organs are rejected by the body when they're transplanted from one person to another.

The reason that these organs are sometimes rejected is because of **cytotoxic T cells**. This happens because T cells notice that the cells of that organ don't have the proper **MHC markers**. As a result, the cytotoxic T cells attack and kill the transplanted organ's cells.

MHC markers are markers found on the surface of our cells' plasma membranes. They give the immune system a window to the inside of the cell to make sure our cells are not infected. MHCs also mark the cell as "self," so that our immune system knows not to attack healthy cells. When an organ is transplanted, sometimes those MHC markers won't match; cytotoxic T cells will recognize that and attack the transplanted organ's cells.

MHC markers are specific to each person, but sometimes one person's MHC markers can be similar enough to another person's that the body won't really recognize the difference.



TERMS TO KNOW

Cytotoxic T Cells

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

MHC Markers

Cellular markers on the plasma membrane that play an important role in mediating adaptive immunity.

2. Steps to Ensure Acceptance

Some steps that are taken before a transplant can be important in making sure that the transplant is accepted:

- MHC markers of the organ are analyzed to see how closely they will match the recipient's MHC markers. Generally, close relatives will have the best match and, therefore, are less likely to be rejected by the body
- Blood typing is done. The blood types of the donor and recipient must also be compatible because agglutination will happen if they are not. If you're mixing two incompatible blood types, it will cause the blood to clot and blood cells to burst. This can cause death.

Post-surgery, drugs are generally given to the recipient. These drugs will suppress the immune system so that it does not respond to the new organ. This allows the body to acclimate to this new organ and accept it.

3. Immunotherapy

The main concept of **immunotherapy** is to use the body's own immune mechanisms and manipulate those as treatments for diseases. Immunotherapy uses two common processes:

- Cytokines
- Monoclonal antibodies



TERM TO KNOW

Immunotherapy

Medical treatments that assist, enhance or suppress our immune response to pathogens.

3a. Cytokines

Cancer occurs when one of our body's own cells mutates and divides uncontrollably. What makes cancer so difficult to combat is the fact that cancerous cells still look like our own body's cells to our immune system, and therefore, we don't fight cancer like we do other diseases.

Cytokines will activate B cells and T cells within the body. Cytokines are often used to treat different types of cancers.

Interferons are a type of cytokine that virus-infected cells release. When a cell has been infected by a virus, it will release these interferons into the body. Normal cells will respond to the release of these interferons by producing a substance that won't allow the virus to multiply. These are used commonly in the treatment of hepatitis C and multiple sclerosis.



TERM TO KNOW

Interferons

Cytokines that help cells during a viral infection; infected cells secrete interferons that warn surrounding cells that a viral infection is ensuing; interferon stimulates the surrounding cells to increase their antiviral defenses.

3b. Monoclonal Antibodies

Monoclonal antibodies are antibodies that are made in a lab by cells that have been cloned from a single plasma cell or B cell



DID YOU KNOW

Monoclonal antibodies used to be produced in lab mice, but currently, the preferred method is to produce them in bacteria. An interesting fact is that some plants can be used to produce these antibodies as well. Monoclonal antibodies can recognize and bind to specific antigens. They are used commonly in home pregnancy tests because they can detect small amounts of a certain hormone only produced when a woman is pregnant.

IN CONTEXT

Monoclonal antibodies are used with a certain type of breast cancer. Herceptin is a drug that's used against this type of breast cancer. Herceptin is a monoclonal antibody that will bind to the HER2 proteins on breast cancer cells. By binding to those proteins, it elicits a response from natural killer cells, which are part of your immune system. These natural killer cells will then attack those cancer cells. This drug does have negative side effects because some of the normal healthy cells in your body contain HER2 as well.



TERM TO KNOW

Monoclonal Antibody

An antibody that specifically targets only one of a pathogen's many antigens (unique chemical markers).

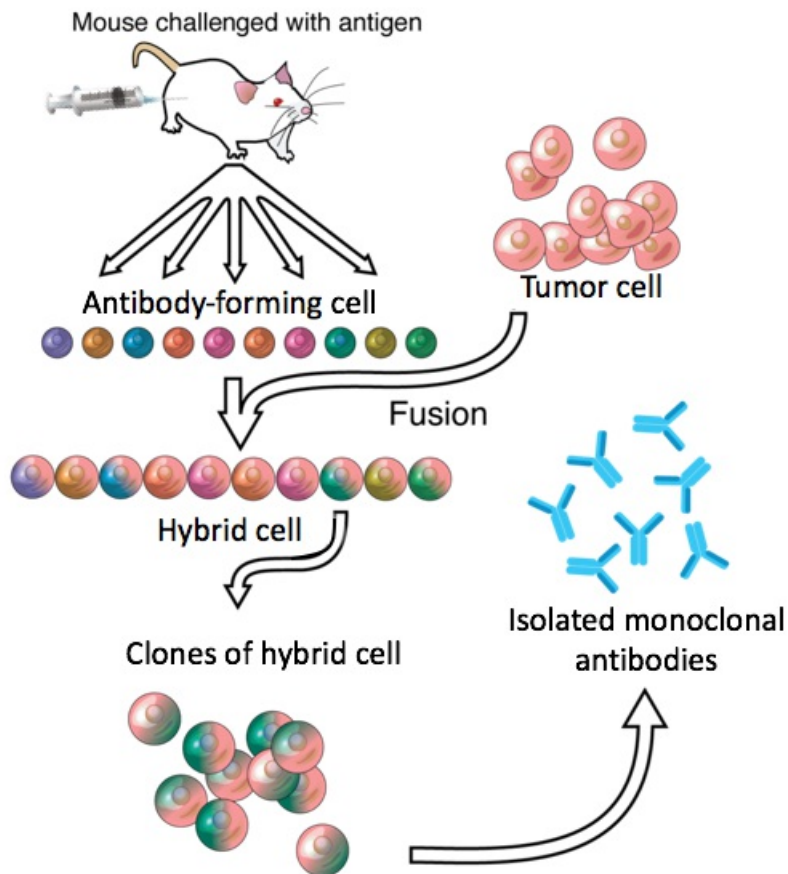
4. Production Of Monoclonal Antibodies

How are commercial antibodies made?

The first step is to recruit an immune system with all its millions of randomly-generated, antibody-producing cells. Thus, a mouse is injected with one of a pathogen's many antigens (unique chemical markers), which causes the mouse to select the correct antibody and mass-produce it.

The monoclonal antibody-forming cells will be isolated from the mouse. In some cases, an antibody-forming cell is going to be combined with a tumor cell to form this type of hybrid, which will then produce desired antibodies. Clones will be made of that hybrid; then those antibodies will be isolated.

Sometimes, the gene for this antibody can be cloned into a bacteria, which will produce the monoclonal antibody faster and cheaper.



SUMMARY

Organ transplant is a common medical practice, but sometimes organs can be rejected. This is because cytotoxic T cells don't recognize the MHC markers of the organ and begin to attack it. **Steps are taken to ensure acceptance** such as matching the MHC markers of an organ and a person and matching blood types. Patients also receive drugs following surgery to suppress their immune system.

Immunotherapy uses the body's own immune system to treat disease. **Cytokines** are used to activate B cells and T cells within the body to treat different kinds of disease like cancer. **Monoclonal antibodies** are antibodies that have been made in a lab for different purposes like home pregnancy tests or treatment of cancer. The **production of monoclonal antibodies** starts with injecting a live host with an antigen, which causes it to produce antibodies. The cell or gene that produces the correct antibody is isolated and mass-produced.

Keep up the learning and have a great day!

Source: THIS WORK IS ADAPTED FROM SOPHIA AUTHOR AMANDA SODERLIND



ATTRIBUTIONS

- [Monoclonal Antibody Process](#) | Author: Wikipedia | License: Creative Commons



TERMS TO KNOW

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