

Difference Between Immunotherapy and Chemotherapy

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Key Difference - Immunotherapy vs Chemotherapy

Cancer is a collection of related diseases that arise due to uncontrolled cell proliferation of a particular type or types of cells. Cancer arises due to a genetic effect which is caused by the mutations in the three main genes the [proto-oncogenes](#), tumor suppressor genes and DNA repair genes. Cancer cells are malignant and have the ability to spread through the [lymph](#) or blood. Cancer therapy is given much attention as the prevalence of more than 200 cancer types have been recorded up to date. Immunotherapy and [chemotherapy](#) are two popular systemic treatment methods for cancer. Immunotherapy is a specific treatment method where the body's [immune system](#) is boosted by restoring the natural immune system of the body by administering mono-clonal [antibodies](#) via vaccines or through [T cell](#) therapy. Chemotherapy is one of the oldest and non-specific cancer treatment methods where different chemicals or cytotoxic drugs are administered to destroy the cells; both malignant and non-malignant cells. The **key difference** between immunotherapy and chemotherapy is that **immunotherapy involves in strengthening the immune system without destroying the cells in the body whereas chemotherapy destroys cells in the body which includes both malignant and non-malignant types.**

What is Immunotherapy?

Immunotherapy, as the name suggests, treats the immune system. It is a novel type of cancer therapy where the patient's immune system becomes the target of the treatment procedure. This therapy is mainly involved in the cancer conditions such as a lymphoma condition, in which the body's immune system is weakened. In immunotherapy, the patient's immune system is boosted by administering immune response cells such as T cells and monoclonal antibodies. This is mainly done via vaccinations. The ultimate goal of the immunotherapy is to re-establish the immune cells in the body in order to enable the body to fight the effects of the cancer cell proliferation and to destroy the specific cancer cells.

Administration of the monoclonal antibodies is one type of immunotherapy. It is a specific method where monoclonal antibodies targeting specific antigens in the cancer cells are administered via vaccines. Once administered they will form antibody-[antigen](#) complexes with the cancer cell antigens. This will lead to the destruction of the particular cancer cells. Monoclonal antibodies are also used as immune checkpoint inhibitors. Immune checkpoints are pathways which are identified by cancer cells and also where these cancer cells have the ability to escape these pathways. Thus, when these pathways are inhibited, the cell growth is hindered finally leading to the destruction of the cancer cells.

T cell therapy is another form of immunotherapy against cancer. The patient's T cells are isolated from the blood. These T cells are modified by attaching specific receptors which would identify the cancer cells, under invitro conditions. Afterwards, the modified T cells are re-administered which will participate in the destruction of the specific cancer cells.

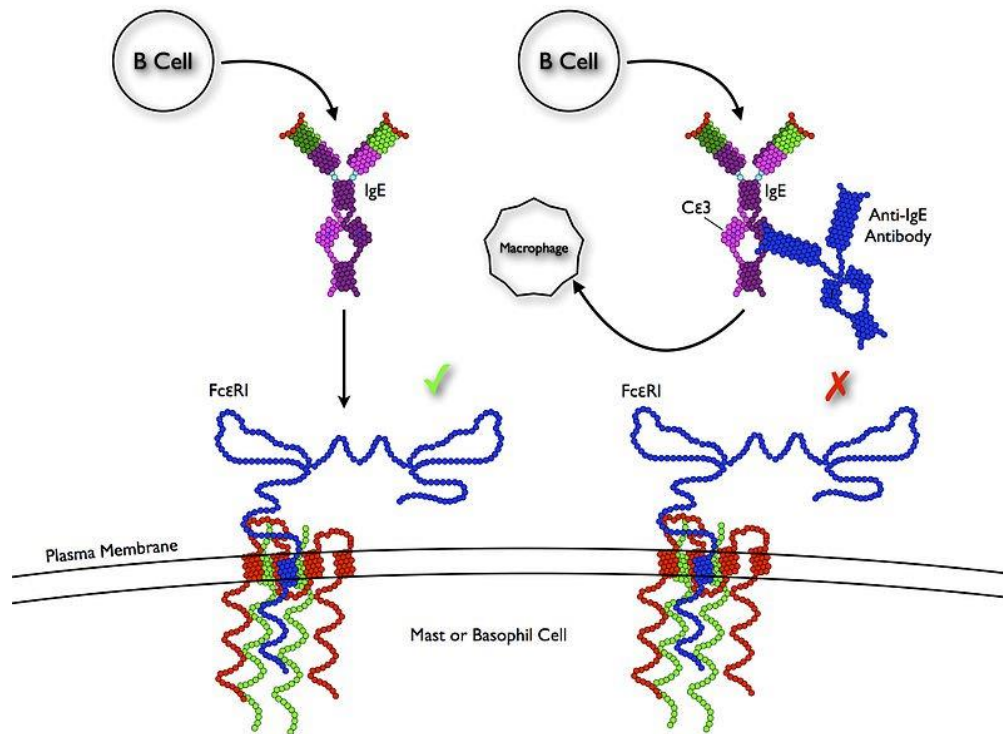


Figure 01: Anti-Allergy Immunotherapy

Immunotherapy is a costly technique. But it is considered to have fewer side effects in comparison with the other cancer treatment methods. It is also considered as a specific therapeutic method for cancer. The disadvantages of immunotherapy are autoimmunity and resistance of cancer cells to immune therapy over long-term treatment.

What is Chemotherapy?

Chemotherapy is one of the oldest and the commonly used cancer treatment method worldwide. Chemotherapy is a non-specific method of cancer treatment. In chemotherapy procedures, cytotoxic chemicals, [toxins](#), and drugs are administered intravenously. These cytotoxic drugs are targeted to a specific cell type that results in the destruction of malignant and non – malignant cells of the particular cell type.

The cytotoxic drugs which are used in chemotherapy have many different mechanisms of action.

- Block the transcription of genes producing the certain cell type.
- Targeted on cell membranes of the cell which leads to the destruction of cells.
- Inhibit the nutrition uptake process of the cells.
- Slow the speed of the cancer cell proliferation.

The type of chemotherapy depends on the stage of cancer, type of cancer and the patient's condition. Depending on these factors, chemotherapy can be given via a single cytotoxic drug or as a combination which is referred to as Combination chemotherapy where multiple drugs are used.



Figure 02: Chemotherapy drugs

There are many side effects in chemotherapy as it results in the destruction of healthy cells in the body. Hair fall, skin pigmentation, respiratory problems, ulcers in the oral cavity and along the gut or respiratory tract, pains and inflammation are the side effects resulting from the chemotherapy treatments.

What are the Similarities Between Immunotherapy and Chemotherapy?

- Both are systemic treatment methods.
- Both therapies can be used as a treatment for cancer.
- Both therapies are administered intravenously.

What is the Difference Between Immunotherapy and Chemotherapy?

Immunotherapy vs Chemotherapy

Immunotherapy is a treatment method where the body's immune system is boosted by restoring the natural immune system of the body.

Chemotherapy is a treatment method which uses cytotoxic drugs to destroy cancer cells.

Specificity	
Immunotherapy is highly specific.	Chemotherapy is non-specific or less specific.
Types	
Monoclonal antibody administration and T cell therapy are types of immunotherapy.	Single cytotoxic drug administration and multiple cytotoxic drug administration are types of chemotherapy.
Side effects	
Less in immunotherapy.	Many side effects as it can destroy the healthy cells as well through Chemotherapy.

Summary - Immunotherapy vs Chemotherapy

Cancer is a non-communicable disease and is one of the leading causes of mortality in the world population. It is of much importance that a stable therapy is developed in order to treat cancer. Immunotherapy and chemotherapy are two current treatment procedures for cancer. Immunotherapy targets in the indirect destruction of cancer cells by boosting the immune system. Chemotherapy targets direct destruction of the cells with the use of high impact cytotoxic drugs. This is the difference between immunotherapy and chemotherapy.

Reference:

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1. 'Anti-Allergy Immunotherapy' By SariSabban - Sabban, Sari (2011) Development of an in vitro model system for studying the interaction of Equus caballus IgE with its high- affinity FcεRI receptor (PhD thesis), The University of Sheffield (CC BY-SA 3.0) via [Commons Wikimedia](#)
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