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## **What is Immunotherapy?** [1]

This section has been reviewed and approved by the [Cancer.Net Editorial Board](#) [2], 03/2013

Immunotherapy (also called biologic therapy or biotherapy) is a type of cancer treatment designed to boost the body's natural defenses to fight the cancer. It uses materials either made by the body or in a laboratory to improve, target, or restore immune system function. Although it is not entirely clear how immunotherapy treats cancer, it may work by stopping or slowing the growth of cancer cells, stopping cancer from spreading to other parts of the body, or helping the immune system increase its effectiveness at eliminating cancer cells.

There are several types of immunotherapy, including monoclonal antibodies, non-specific immunotherapies, and cancer vaccines.

### **Monoclonal antibodies**

When the body's immune system detects antigens (harmful substances, such as bacteria, viruses, fungi, or parasites), it produces antibodies (proteins that fight infection). Monoclonal antibodies are made in a laboratory, and when they are given to patients, they act like the antibodies the body produces naturally. Monoclonal antibodies are given intravenously (through a vein) and work by targeting specific proteins on the surface of cancer cells or cells that support the growth of cancer cells. When monoclonal antibodies attach to a cancer cell, they may accomplish the following goals:

**Allow the immune system to destroy the cancer cell.** The immune system doesn't always recognize cancer cells as being harmful. To make it easier for the immune system to find and destroy cancer cells, a monoclonal antibody can mark or tag them by attaching to specific parts of cancer cells that are not found on healthy cells.

**Prevent cancer cells from growing rapidly.** Chemicals in the body called growth factors attach to receptors on the surface of cells and send signals that tell the cells to grow. Some cancer cells make extra copies of the growth factor receptor, which makes the cancer cells grow faster than normal cells. Monoclonal antibodies can block these receptors and prevent the growth signal from getting through.

**Deliver radiation directly to cancer cells.** This treatment, called [radioimmunotherapy](#) [3], uses

monoclonal antibodies to deliver radiation directly to cancer cells. By attaching radioactive molecules to monoclonal antibodies in a laboratory, they can deliver low doses of radiation specifically to the tumor while leaving healthy cells alone. Examples of these radioactive molecules include ibritumomab tiuxetan (Zevalin) and tositumomab (Bexxar).

**Diagnose cancer.** Monoclonal antibodies carrying radioactive particles may also help diagnose certain cancers, such as colorectal, ovarian, and prostate cancers. Special cameras identify the cancer by showing where the radioactive particles accumulate in the body. In addition, a pathologist (a doctor who specializes in interpreting laboratory tests and evaluating cells, tissues, and organs to diagnose disease) may use monoclonal antibodies to determine the type of cancer a patient may have after tissue has been removed during a biopsy [4].

**Carry powerful drugs directly to cancer cells.** Some monoclonal antibodies carry other cancer drugs directly to cancer cells. Once the monoclonal antibody attaches to the cancer cell, the cancer treatment it is carrying enters the cell, causing the cancer cell to die without damaging other healthy cells. Brentuximab vedotin (Adcetris), a treatment for certain types of Hodgkin and non-Hodgkin lymphoma, is one example

Other monoclonal antibodies approved by the U.S. Food and Drug Administration (FDA) to treat cancer include:

- Alemtuzumab (Campath)
- Bevacizumab (Avastin)
- Cetuximab (Erbix)
- Ipilimumab (Yervoy)
- Ofatumumab (Arzerra)
- Panitumumab (Vectibix)
- Rituximab (Rituxan)
- Trastuzumab (Herceptin).

Clinical trials of monoclonal antibodies are ongoing for several types of cancers. Learn more about clinical trials [5].

Side effects of monoclonal antibody treatment are usually mild and are often similar to an allergic reaction. Possible side effects include rashes, low blood pressure, and flu-like symptoms, such as fever, chills, headache, weakness, extreme tiredness, loss of appetite, upset stomach, or vomiting.

Although monoclonal antibodies are considered a type of immunotherapy, they are also classified as a type of targeted treatment (a treatment that specifically targets faulty genes or proteins that contribute to cancer growth and development). Learn more about targeted treatments [6].

## **Non-specific immunotherapies**

Like monoclonal antibodies, non-specific immunotherapies also help the immune system destroy cancer cells. Most non-specific immunotherapies are given after or at the same time as another cancer treatment, such as chemotherapy or radiation therapy. However, some non-specific immunotherapies are given as the main cancer treatment.

Two common non-specific immunotherapies are:

**Interferons.** Interferons help the immune system fight cancer and may slow the growth of cancer cells. An interferon made in a laboratory, called interferon alpha (Roferon-A [2a], Intron A [2b], Alferon [2a]), is the most common type of interferon used in cancer treatment. Side effects of interferon treatment may include flu-like symptoms, an increased risk of infection, rashes, and thinning hair.

**Interleukins.** Interleukins help the immune system produce cells that destroy cancer. An interleukin made in a laboratory, called interleukin-2, IL-2, or aldesleukin (Proleukin), is used to treat kidney cancer and skin cancer, including melanoma. Common side effects of IL-2 treatment include weight gain and low blood pressure, which can be treated with other medications. Some people may also experience flu-like symptoms.

## **Cancer vaccines**

A vaccine is another method used to help the body fight disease. A vaccine exposes the immune system to a protein (antigen) that triggers the immune system to recognize and destroy that protein or related materials. There are two types of cancer vaccines: prevention vaccines and treatment vaccines.

**Prevention vaccine.** A prevention vaccine is given to a person with no symptoms of cancer to prevent the development of a specific type of cancer or another cancer-related disease. For example, Gardasil is a vaccine that prevents a person from being infected with the human papillomavirus (HPV), a virus known to cause cervical cancer and some other types of cancer. It was the first FDA-approved vaccine for cancer. Cervarix is another vaccine that is approved to prevent cervical cancer in girls and women. Learn more about [HPV vaccination for cervical cancer](#) [7] and the [role of HPV in other cancers](#) [8]. In addition, the U.S. Centers for Disease Control and Prevention recommends that all children should receive a vaccine that prevents infection with the hepatitis B virus, which may cause liver cancer.

**Treatment vaccine.** A treatment vaccine helps the body's immune system fight cancer by training it to recognize and destroy cancer cells. It may prevent cancer from coming back, eliminate any remaining cancer cells after other types of treatment, or stop cancer cell growth. A treatment vaccine is designed to be specific, which means it should target the cancerous cells without affecting healthy cells. At this time, sipuleucel-T (Provenge) is the only treatment vaccine approved in the United States. It is designed for treating metastatic prostate cancer. Additional cancer treatment vaccines are still in development and only available through clinical trials.

Learn more about [cancer vaccines](#) [9].

## Questions to ask the doctor

Talk with your doctor about whether immunotherapy may be part of your treatment plan. If so, consider asking the following questions:

- What type of immunotherapy do you recommend? Why?
- What are the goals of this treatment?
- Will immunotherapy be my only treatment? If not, what other treatments will be a part of my treatment plan?
- How will I receive immunotherapy treatment and how often?
- What are the possible side effects of immunotherapy, both in the short term and the long term?
- How will this treatment affect my daily life? Will I be able to work, exercise, and perform my usual activities?
- What clinical trials of immunotherapies are open to me?
- Whom should I call for questions or problems?

## More Information

[Types of Treatment](#) [10]

[Managing Side Effects](#) [11]

## Additional Resources

[American Cancer Society: Immunotherapy](#) [12]

[National Cancer Institute: Cancer Vaccines](#) [13]

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### Links:

[1] <http://www.cancer.net/navigating-cancer-care/how-cancer-treated/immunotherapy-and-vaccines/what-immunotherapy>

[2] <http://www.cancer.net/about-us>

[3] <http://www.cancer.net/node/24728>

[4] <http://www.cancer.net/node/24406>

[5] <http://www.cancer.net/node/24863>

[6] <http://www.cancer.net/node/24729>

[7] <http://www.cancer.net/node/24385>

[8] <http://www.cancer.net/node/24561>

[9] <http://www.cancer.net/node/24721>

[10] <http://www.cancer.net/node/25071>

[11] <http://www.cancer.net/node/25238>

[12] [http://www.cancer.org/docroot/ETO/eto\\_1\\_3\\_Immunotherapy.asp](http://www.cancer.org/docroot/ETO/eto_1_3_Immunotherapy.asp)

[13] <http://www.cancer.gov/cancertopics/factsheet/Therapy/cancer-vaccines>