

Immunotherapy

Today, immunotherapy is one of the most exciting areas of new discoveries and treatments for many different kinds of cancer.

Researchers now know that the interaction between our immune system and cancer is very complex.

Understanding how the immune system works is opening the doors to developing new treatments that are changing the way we think about and treat cancer.



CANCER SUPPORT
COMMUNITY

SUPPORT FOR FINDING INFORMATION ABOUT IMMUNOTHERAPY

Cancer Support Community 1-888-793-9355

www.cancersupportcommunity.org

National Cancer Institute 1-800-422-6237 www.cancer.gov

U.S. Food and Drug Administration 1-888-463-6332 www.fda.gov

Your Immune System and Cancer Treatment

Researchers have been interested in using the body's natural defense system to fight cancer for over 100 years, but the progress in the last decade has been rapid and exciting, producing new approaches with promising results. In that sense, immunotherapy is a new and emerging area of cancer treatment.

As you read this, keep in mind that even the “basics” of immunotherapy can be complicated and confusing. If you are interested in immunotherapy, you should discuss your options with your doctor and health care team. Right now, most people receiving immunotherapy are treated in specialized cancer centers and many of them are enrolled in clinical trials. That will change as more trials are completed and more drugs are approved by the Food and Drug Administration (FDA) to treat different kinds of cancer. The most important things you can do are to:

- Be treated by doctors who have experience and expertise in treating your kind of cancer
- Be aware of your treatment options
- Talk with your health care team throughout your treatment

TIP: Consider inviting a “partner” to sit in with you during your appointments. He or she can assist in your understanding of the important information presented.

“We know the immune system can recognize and kill cancer cells—and there are a number of ways it can do this. As we learn and understand more, the true power of the immune system can be realized.”

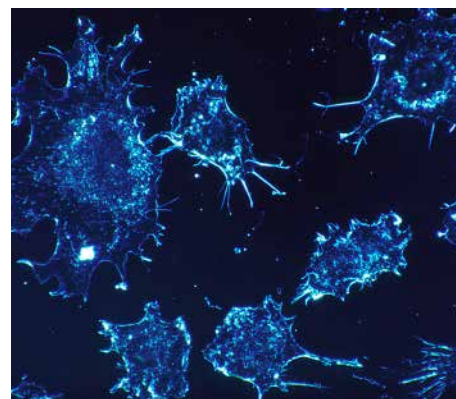
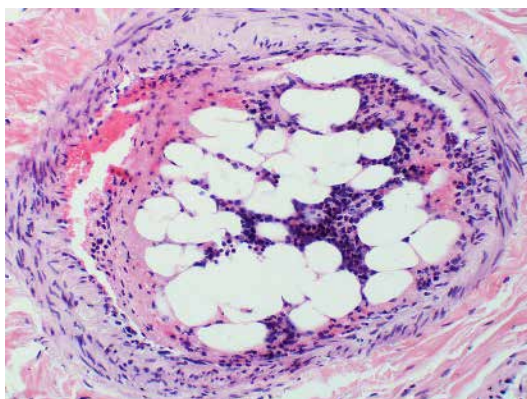
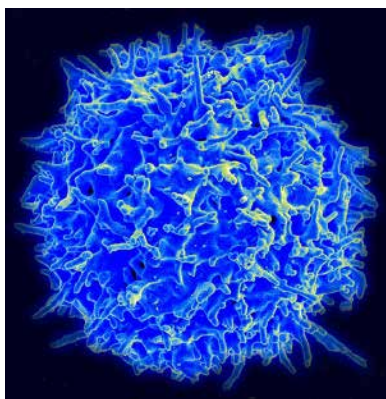
— Kim Lyerly, MD

DEFINITIONS:

THE IMMUNE SYSTEM is your body's defense system against disease. Its job is to prevent or limit infections by recognizing and destroying foreign substances (like bacteria and viruses) and abnormal or unhealthy cells (like cancer cells).

IMMUNO-ONCOLOGY is the field of cancer research that works to understand the immune system and how it interacts with cancers—and finds ways of using your body's immune system to treat or prevent cancer.

IMMUNOTHERAPY is a type of treatment that uses the immune system to treat cancer as well as other diseases.



LEFT TO RIGHT: T-CELL; BONE MARROW; CANCER CELLS

More About Your Immune System

The immune system is like an army. It has many different kinds of “soldiers,” all with different functions that work together to protect your body from invaders such as bacteria or viruses or abnormal or unhealthy cells that cause disease. Some of these soldiers recognize the unhealthy cells, others communicate with other cells or tissues in your body, while others are the fighters that attack and destroy the enemy.

“What’s tricky about focusing the immune system on cancer is that, in many ways, cancer cells look very much like normal cells.”

— Lynn Shuchter, MD

The immune system includes a network of cells, tissues and organs including:

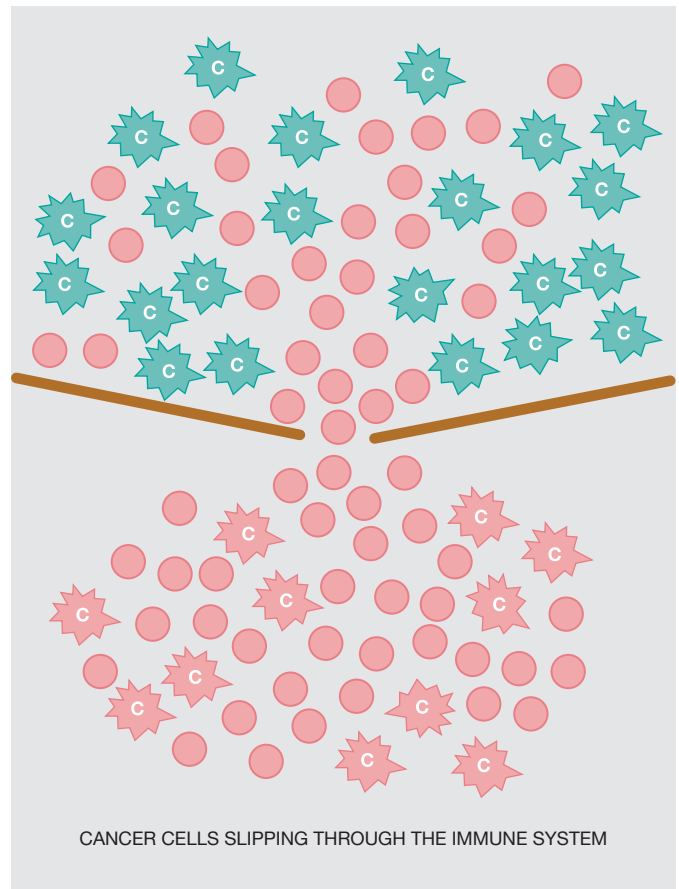
BLOOD CELLS: The most common immune blood cells are types of white blood cells called B cells and T cells.

THE LYMPHATIC SYSTEM: This is a network of channels and tissue that extend throughout our bodies. It is critical to moving immune cells to the various tissues and in removing “debris” from the system.

ORGANS: Our skin is a first line defense against many invaders. The thymus gland (located in the upper chest) is where the T cells mature. The spleen (located behind your stomach) plays an important role in processing information from the bloodstream and activating the immune system.

DEFINITIONS:

BONE MARROW is a soft, fatty substance inside the bone. It acts as a “factory” that produces different kinds of cells including many types of blood cells.



The Immune System and Cancer

The most important function of the immune system is to know the difference between self and non-self. Self means your own body tissues. Non-self means any abnormal cell or foreign invader, such as bacteria, viruses, parasites and fungus. Normally, your immune system will not attack anything that it identifies as a healthy part of self.

The problem with cancer cells is that they arise from our cells, but there are differences. As they grow and spread, cancer cells undergo a series of changes, or mutations, becoming less like normal cells. Sometimes our immune system can detect these differences and respond. Other times, the cancer cells slip through the defenses or are actually able to inhibit the immune system.

Immunotherapy for Cancer Today

We know that the immune system does recognize cancer cells as unhealthy or abnormal and often tries to fight the tumor. The goal of the field of immunoncology, also known as tumor immunology, is to understand exactly how the immune system interacts with the cancer, and then use that information to develop new immunotherapy treatments.

“Cancer cells are tricky. They put almost a cape over themselves so that the immune system cannot recognize the cancer cell.”

— Lynn Shuchter, MD

Types of Cancer Immunotherapy

The complexity of the immune system makes it a challenging area for cancer research, but it also means there are many ways to think about how to make it work. Today, there are multiple approaches to immunotherapy for cancer, but they basically fall into two broad categories:

- Agents that boost the immune response
- Agents that enable the immune system to recognize and fight the tumor

BOOSTING THE IMMUNE RESPONSE This approach uses a drug or agent to trigger the immune system—much in the same way getting the flu does. The idea behind this is that a “revved up” immune system will be more effective in fighting the cancer. There are several ways to do this:

■ **CYTOKINES** have been used for years. They work by stimulating the growth of T cells and activating other immune cells. Interleukins and interferon are examples of cytokines that have shown some effectiveness in treating cancer. High dose interleukin 2 (IL2) produces excellent responses in a small percentage of people with advanced melanomas and kidney cancers. Monoclonal antibodies are also used to boost the immune response.

■ **THERAPEUTIC VACCINES** work to cause an active immune response against the cancer. Although there are many clinical trials underway, there is only one cancer vaccine approved, sipuleucel-T (Provenge®), and it treats prostate cancer.

■ **ADOPTIVE T CELL THERAPIES** use T cells collected from a person’s blood. The T cells are then re-engineered to produce special receptors on their surface called chimeric antigen receptors (CARs). Once returned to the person, these CARs allow the T cells to recognize and kill cancer cells. CAR-T cells

The key to successful immunotherapy is to make sure that the immune system can detect cancer cells, identify them as abnormal and mount a defense against them. This means:

IDENTIFYING ways in which cancer cells are different from normal cells. These differences are found on the surface of cells. Identifying these differences creates the possibility of developing immunotherapies that target them

UNDERSTANDING the ways in which cancer cells “put the brakes” on or escape detection from the immune system and finding ways to block this from happening

STIMULATING parts of the immune system, usually blood cells, to take a more active role in killing cancer cells

BLOCKING the growth factors that allow cancer cells to grow rapidly

CARRYING cancer drugs directly to cancer cells

have been studied in clinical trials and have shown excellent results in children and adults with leukemia and lymphoma. More trials in these and other cancer types are underway.

ENABLING THE IMMUNE RESPONSE The newest approach to immunotherapy for cancer is based on new, emerging knowledge of the ways in which the immune system interacts with cancer cells.

■ **MONOCLONAL ANTIBODIES** are versatile tools that act in different ways to treat a wide variety of cancers. Immunotherapy is one of the promising approaches for these agents. Immunotherapy using monoclonal antibodies generally works by making the cancer cells more visible to the immune system and more vulnerable to its attack.

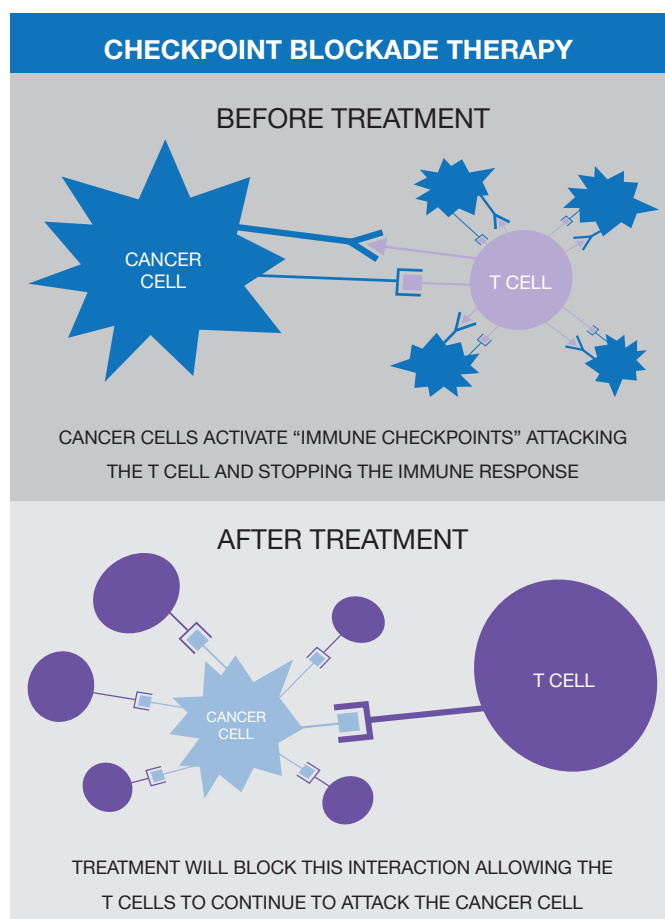
Monoclonal antibodies are made in the laboratory and when given to patients act like the ones that your body makes naturally. Each monoclonal antibody is manufactured to identify and attach to a specific defect in cancer cells.

There are currently over a dozen monoclonal antibodies approved to treat many types of cancer. Although there are many agents being developed and tested, right now there is only one FDA approved monoclonal antibody that is considered a form of immunotherapy, which is ipilimumab (Yervoy®) for advanced melanoma. Other drugs are expected to be approved soon, as more clinical trials are completed with several kinds of cancer.

■ **CHECKPOINT INHIBITORS / BLOCKADE THERAPY:** Every time the immune system is stimulated, there are checkpoints—complex signals that stop immune cells from attacking and destroying normal tissue. Cancer cells use these checkpoints to put the brakes on the immune response. New treatments called checkpoint inhibitors block the ability of cancer cells to use these checkpoints to escape from the immune system and reactivate T cells, which can fight the tumor.

Ipilimumab (Yervoy®) is a checkpoint inhibitor (and monoclonal antibody) that has been shown to be effective in treating advanced melanoma and kidney cancer, and is now being tested for other cancer types.

PD-1 inhibitors are also a new group of checkpoint inhibitors that have shown great promise in trials for a variety of cancers, including bladder cancer, kidney cancer, breast cancer, and cervical cancer. In 2014, the FDA approved PD-1 inhibitors pembrolizumab (Keytruda®) and nivolumab (Opdivo®). Both are approved to treat people with advanced melanoma who no longer respond to other treatments. In March 2015, the FDA granted nivolumab (Opdivo®) expanded approval. It is now approved for use to treat people with metastatic squamous non-small cell lung cancer who no longer respond after treatment with chemotherapy.



Who is Eligible for Immunotherapy?

There is widespread interest and excitement throughout the cancer community about the potential for using immunotherapy to treat different kinds of cancer. As researchers learn more about the interaction between our immune system and cancer, they will be able to apply that knowledge to more treatment options.

“It’s important that every patient diagnosed with cancer should ask ‘is a clinical trial available for me?’ because many times getting access to these new treatments is only possible by enrolling in a clinical trial.”

— Lynn Shuchter, MD

Most people who receive immunotherapy today have cancers that are advanced. Their cancers have either recurred and spread after primary treatment, or were diagnosed in an advanced stage. These are often the same people who do not have effective treatment options available to them. As the field of immunotherapy moves forward, researchers will begin new trials with people who are at high risk for having their cancers recur or spread.

Before the FDA approves a drug, it is tested in clinical trials. This is important because it is the only way to gather the information needed to establish whether the drug is safe and effective. There are significant benefits to participating in a clinical trial.

These studies provide the best and often the only access to innovative therapies. People in clinical trials are assured of getting either the current standard of treatment or the new option being tested. In most instances, insurance covers the costs of participating in clinical trials. Many people who enroll in clinical trials feel positive about contributing to research that improves the outcomes for cancer treatment.

Once the FDA approves a drug, it can be given to anyone with that type of cancer. At this time, almost all immunotherapy is given in specialized cancer centers and mostly as part of a clinical trial.

There are some people who cannot receive immunotherapy. These individuals often have health problems that make it impossible to take these drugs safely. You should always discuss new treatment decisions with your doctor and treatment team.

Will Immunotherapy cure my cancer?

It is important to remember that despite the real promise of these therapies, right now, they do not “cure” advanced disease. Many people respond very well to these agents, and some have responses that are complete and long lasting. It is more common, however, to have a partial response, meaning the tumor shrinks or remains stable, but does not disappear. One of the most challenging problems facing cancer research today is drug resistance, which means that even when a person does achieve a good response to a treatment, the cancer cells often become resistant over a period of time and the tumor can begin growing again. Researchers are working to discover ways to overcome this problem.

“Whether or not my immune system has attacked the cancer due to immunotherapy, we’re not sure yet. It’s still on the early side so we aren’t sure if I’m a responder to this particular immunotherapy.”

— Matthew, Living with metastatic melanoma

Side Effects

When we think of immunotherapy, we think of it as “natural”—as our body’s own defense system. That does not mean, however, that immunotherapy does not have side effects. These effects are generally different from those caused by chemotherapy or radiation therapy. They depend on the kind of drugs or agents that are used.

In many cases, these side effects are not severe, or may be short-lived and are well tolerated by the individuals taking immunotherapy. In others, they can be very severe and even life threatening.

THE MOST COMMON SIDE EFFECTS OF IMMUNOTHERAPY:

- *FLU-LIKE SYMPTOMS*
- *FEVER*
- *RASHES*
- *FATIGUE*
- *DROPS IN BLOOD PRESSURE OR DIZZINESS*

“Side effects from immunotherapy can sometimes be more challenging to manage, or to recognize, so it is very important to call your doctor when you notice anything new.”

— Suzanne McGettigan, Nurse Practitioner

Sometimes, the side effects do not occur right after treatment is given, and little is known at this time about whether there are any long term side effects. Your doctor will discuss the potential side effects of immunotherapy with you before you begin treatment. Having one or more side effects does not mean that you will be removed from a clinical trial or have to stop taking a drug or drugs that are working for you.

NOTE: It is very important that anyone taking immunotherapy let their health care team know right away if they develop any side effects. Some of these side effects can be very serious—but they are treatable.

An Exciting Future

Immunotherapy is still a new field of cancer treatment. The development of new immunotherapies is based upon many years of work to understand the complex working of our immune systems and its interaction with cancer cells. As that knowledge deepens, researchers will hold the keys to developing new treatments that have the potential to change the ways in which we treat cancer, and may lead to new approaches to preventing cancer.

General Cancer Information, Survivorship & Support

American Cancer Society 1-800-227-2345 www.cancer.org

CancerCare 1-800-813-4673 www.cancercare.org

Cancer.net 1-888-651-3038 www.cancer.net

National Cancer Institute 1-800-422-6237 www.cancer.gov

Patient Advocate Foundation 1-800-532-5274 www.patientadvocate.org

CANCER SUPPORT COMMUNITY RESOURCES

The Cancer Support Community's (CSC) resources and programs are available free of charge. To access any of these resources below call 1-888-793-9355 or visit www.cancersupportcommunity.org

CANCER SUPPORT HELPLINE ®

Whether you are newly diagnosed with cancer, a long-time cancer survivor, caring for someone with cancer, or a health care professional looking for resources, CSC's toll-free Cancer Support Helpline (1-888-793-9355) is staffed by licensed CSC Helpline Counselors available to assist you Mon-Fri 9 am- 9pm ET.

OPEN TO OPTIONS ®

If you are facing a cancer treatment decision, Open to Options® is a research-proven program that can help you prepare a list of questions to share with your doctor. In less than an hour, our Open to Options specialists can help you create a written list of specific questions about your concerns for your doctor.

FRANKLY SPEAKING ABOUT CANCER ®

CSC's landmark cancer education series provides trusted information for cancer patients and their loved ones. Information is available through publications, online, and in-person programs.

AFFILIATE NETWORK SERVICES

Almost 50 locations plus more than 100 satellites around the country offer on-site support groups, educational workshops, and healthy lifestyle programs specifically designed for people affected by cancer at no cost to the member.

THE LIVING ROOM, ONLINE

On CSC's website you will find online support groups, discussion boards and social networking.

FRANKLY SPEAKING ABOUT CANCER: YOUR IMMUNE SYSTEM & CANCER TREATMENT PROGRAM PARTNERS:



A special thanks to our program advisory board who provided input and review, Heather Difilippo, NP, Abramson Cancer Center of the University of Pennsylvania; Danielle Hicks, Bonnie J. Addario Lung Cancer Foundation; Ellen Levine, LCSW, OSW-C, Cancer Support Community Central New Jersey; Kim Lyerly, MD, Duke University; Samir Khleif, MD, Georgia Regents University Cancer Center; Susan Mantel, LUNGevity; Louise Perkins, PhD, Melanoma Research Alliance; Patty Spears, Cancer Research Advocate; Jim Williams, Chair, Pennsylvania Prostate Cancer Coalition; Alice Yuroff, PhD, Free to Breathe.

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