

Your
Journal

Targeted Cancer Therapy

The TV Series

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UNDERSTANDING TARGETED CANCER THERAPY

The disease cancer eventually touches almost every family or individual in some way. The American Cancer Society estimates over one million Americans will be newly diagnosed with cancer each year. Chemotherapy is one of the most common courses of treatment for cancers that can not be removed surgically. Traditional chemotherapy drugs kill cancer through toxic or poisonous effects. However, they tend to damage normal tissues as well, and as a result, patients may suffer significant negative side effects.

Basic scientific research over the past two decades has brought significant advancements in our understanding of how cancer develops at the molecular level. Armed with this knowledge, scientists have begun to design drugs that take aim at those specific abnormal genes and proteins driving the growth of cancer. In contrast to the shotgun approach of chemotherapy, these new targeted therapies hone into the traits of cancer cells that make them different than normal cells, meanwhile sparing normal tissues. These breakthrough drugs are revolutionizing medical oncology, allowing treatments even for patients with rare and previously untreatable types of the disease.

The body is programmed so that its various tissues and organs grow only into suitable proportions with well defined numbers of cells. When cells die, the remaining cells divide to replace the dead ones. In normal tissue, there are tightly regulated mechanisms to make sure that only the dead cells are replaced, and no more.

Cancerous cells are dangerous because they no longer recognize the body's normal programming to maintain balanced tissues. Cancer cells may divide in a self sustained manner in the absence of the usual requirement for growth signals. Meanwhile, they ignore other signals to stop. Cancer cells may lose their sensitivity to signals instructing them when it is time to die, thus cancer cells become immortal. In contrast to normal tissues, cancer cells have acquired defective molecular programming causing them to act in dysfunctional and seemingly selfish ways. Their unrestrained growth causes masses of excess, irregular cells known as tumors.

Each type of cancer is caused by its own unique collection of abnormalities at the molecular level. As scientists learn the basis of these defects, they are then able to design drugs that target the specific cellular molecules involved in carcinogenesis and tumor growth. As these drugs work precisely against particular cellular molecules, they are sometimes called molecular-targeted drugs or molecularly targeted therapies.

By focusing on molecular and cellular changes that are specific to cancer, targeted cancer therapies may be more effective than current treatments and less harmful to normal cells. Targeted cancer therapy has fewer of the side effects that people frequently associate with chemotherapy. Some targeted therapies are given to patients by IV, but many are an oral, pill form, which is more convenient to patients and allows for daily dosing. As with any medication, targeted therapies have their own set of potential side effects. **Those side effects include:**

- Fatigue
- Nausea
- Rashes
- Vomiting
- Loss of appetite
- Flu-like symptoms

Targeted cancer therapy sometimes becomes the new standard of treatment after showing superior benefits in clinical trials. In other cases, best results are obtained when the targeted cancer therapy is combined with traditional cancer treatments such as chemotherapy and radiation. Targeted cancer therapies in the future may be used in combinations with each other, as recent research indicates that interfering with many of the cancer cell's defects at the same time may be much more beneficial to patients.

DIAGNOSIS & MANAGEMENT

Scientific advancements are helping to turn an important corner in cancer care. Cancer diagnosis and treatment have come a long way from the first therapies invented more than 100 years ago. As researchers and physicians learn more about the way the cell works on a molecular level, they understand more about what makes tumors grow or survive. Treatments that were never even thought possible are now available because of this knowledge of the basic biology and chemistry of the cell.

Targeted cancer therapies include several types of drugs. Some examples include:

▮ **Signal Transduction Inhibitors.** These small molecules interfere with cell surface receptors that relay growth signals. Signal transduction inhibitors may also inhibit proteins functioning as enzymes inside of cells that speed up the chemical reactions for growth. The most common cellular targets for signal transduction inhibitors are enzymes classified as protein kinases and cell surface receptor tyrosine kinases. Abnormalities in these enzymes are known to have a role in several forms of cancer.

▮ **Small Molecule Drugs** have been approved for treating certain cancers, such as chronic myeloid leukemia, gastrointestinal stromal tumor and non-small cell lung cancer, as well as cancers of the breast, colon, esophagus, head and neck, pancreas, prostate, stomach and rectum

▮ **Cell-death-inducing Drugs.** These types of drugs directly cause cell death (apoptosis) by interfering with proteins necessary for the survival of cancer cells. Cancer cells acquire abnormalities that allow them to evade normal mechanisms of cell death. So cell-death-inducing drugs aim to knock out those processes that keep cancer cells alive indefinitely.

Cell-death-inducing drugs are approved to treat refractory multiple myeloma. Other cell-death-inducing drugs are being studied for use in non-Hodgkin's lymphoma, leukemia and some solid tumors.

▮ **Angiogenesis Inhibitors.** In order for cancer to grow it relies on the formation of new blood vessels from healthy, surrounding tissue (a process called angiogenesis). By inhibiting blood supply to the tumor, angiogenesis inhibitors starve tumors of their ability to grow.

Thus far, three angiogenesis inhibitors have received approval for advanced colorectal cancer or renal cancer. Other angiogenesis inhibitors are being studied for use in other types of cancers.

▮ **Gene Therapy.** Cancer cells may be missing certain genes or have too much of other genes, making the cancer cells grow and proliferate uncontrollably. Gene therapy attempts to correct those errors by destroying cancerous genetic material within cells.

These advances in medicine rely on specially designed research studies, known as clinical trials. Clinical trials are conducted on patients, usually to evaluate a new or investigational treatment. Each study is designed to answer specific questions and to find better ways to treat patients. If standard treatments have failed for cancer patients, they may be eligible to join a clinical trial.

If a patient does not qualify for a clinical trial or is too ill to participate in a study, the patient and the physician may be able to seek a special exemption that would enable the patient to take an experimental drug. The physician along with the patient will need to submit an application and, if approved by the Food and Drug Administration (FDA), they can receive special permission to use a drug.

Advances in treating devastating diseases such as cancer are continuing to develop at startling speeds. Researchers are confident we'll be seeing more targeted cancer therapies that will help tailor treatments to individual patient's needs, which means more patients and families can benefit from a better quality of life during treatment and a longer life as a result.

FREQUENTLY ASKED QUESTIONS

Q What is the stage of development for targeted cancer therapy?

A Most targeted cancer therapies are in preclinical testing (research with animals), but some are in clinical trials (research studies with people), or have been approved by the U.S. Food and Drug Administration.

Q Is targeted cancer therapy being studied for use alone?

A Targeted cancer therapies are being studied for use as single agents, in combination with each other, and in combination with other cancer treatments, such as chemotherapy.

Q How long does it take for a drug to get approved?

A From early laboratory studies to clinical trials and final approval, it takes an estimated eight and a half years for a drug to move through the development process in the United States.

Q What would happen if cancer is left untreated?

A If cancer is left untreated it may eventually cause extreme illness or even death.

Q What does the term carcinogenesis mean?

A Carcinogenesis is the process by which normal cells transform into cancer cells.

Q What does the term metastasis mean?

A Metastasis is the spread of cancer from its primary site to other places in the body.

Q What percentage of cancer patients hit the 5 year survival mark?

A Reports compiled by the National Cancer Institute estimate the 5-year relative survival rate of cancer patients to be 65 percent.

Q What is the cancer genome atlas program?

A The National Cancer Institute is supporting a project known as the cancer genome atlas, which is an attempt to classify and characterize the genetic makeup of a whole variety of different human cancers.

Q Ultimately, what impact will targeted therapies have on cancer treatment?

A Targeted cancer therapies will give physicians a better way to tailor cancer treatment for each patient. Eventually, treatments may be individualized based on the unique set of molecular targets produced by the patient's tumor. Targeted cancer therapies also have the potential to help cancer patients live longer, healthier lives.

DATA, RESOURCES, HOTLINES, PUBLICATIONS and MEDIA CONTACTS

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American Cancer Society

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Atlanta, GA 30329
(P) 800-ACS-2345
www.cancer.org

People Living with Cancer

1900 Duke Street Suite 200
Alexandria, VA 22314
(P) 888-651-3038
www.plwc.org

American Society of Clinical Oncology

1900 Duke Street
Suite 200
Alexandria, VA 22314
(P) 703-299-0150
www.asco.org

American Association for Cancer Research

Public Ledger Building
Suite 826
150 S. Independence Mall West
Philadelphia, PA 19106-3483
(P) 215-440-9300
www.aacr.org

Cancer Care

275 Seventh Ave.
Floor 22
New York, NY 10001
(P) 1-800-813-HOPE
www.cancercare.org

National Cancer Institute

(P)1-800-4-CANCER
www.cancer.gov

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www.healthybodyhealthymind.com

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