

What are targeted therapies?

Targeted therapies attack specific proteins or pathways involved in the growth of a cancer cell. For example, the drug trastuzumab (Herceptin) targets a protein called HER2 that is found on the outside of some cancer cells.

Unlike chemotherapy drugs, targeted therapies kill only the cancer cells with the specific proteins they were designed to target, so not everyone can use these drugs. They kill the cancer cells with little harm to healthy cells.

Researchers are working to find more targets and develop new targeted therapies. Most new targeted therapies are first studied in clinical trials for metastatic breast cancer (MBC).

How do targeted therapies work?

Every cell in the body contains almost 30,000 genes. Each of these genes makes a different protein. Each protein has a different job in the cell. Targeted therapies stop specific proteins from helping cancer cells survive. When the specific proteins are blocked or stop working, the cancer cells die.



Types of targeted therapies

Epidermal growth factor receptors (EGFRs) are proteins on the outside of cancer cells that accept messages telling the cells to grow and divide. A targeted therapy for EGFRs works by blocking the receptors for EGFRs.

Monoclonal antibodies

Antibodies fight infection in the body by attacking “foreign proteins.” For some reason, the body doesn’t see cancer as an infection and antibodies are not produced. Monoclonal antibodies are made in a lab. They seek specific targets in cancer cells and keep the cancer from growing.

- **Trastuzumab (Herceptin)** - an antibody that targets HER2-positive cancer cells and can slow or stop the growth of the cancer cells. HER2-positive breast cancers have high amounts of a protein called human epidermal growth factor receptor 2 (HER2) on the outside of their cancer cells. The HER2 protein is important for cancer cell growth. Trastuzumab is used to treat HER2-positive breast cancers in both early stage and metastatic breast cancers.
- **Pertuzumab (Perjeta)** - an antibody that targets HER2-positive cancer cells in a different way than trastuzumab. Pertuzumab is used to treat HER2-positive MBC that has not been treated with chemotherapy, trastuzumab or lapatinib.

Enzyme inhibitors

Enzymes are proteins that cause certain chemical reactions in the body to start. Enzyme inhibitors stop some enzymes from working and in doing so block the activity of cancer cells.

- **Lapatinib (Tykerb) and other tyrosine-kinase inhibitors** - drugs that target enzymes important for cell functions (called tyrosine-kinase enzymes). These drugs can block tyrosine-kinase enzymes at many points along the cancer growth pathway. Lapatinib is currently used to treat HER2-positive MBC that has already been treated with chemotherapy and trastuzumab. Other tyrosine-kinase inhibitors are under study in clinical trials.
- **Trastuzumab emtansine (T-DM1, Kadcyla)** - a new targeted therapy for HER2-positive MBC. T-DM1 consists of trastuzumab and a chemotherapy called DM1. Combining these drugs allows the targeted delivery of chemotherapy to HER2-positive cancer cells. T-DM1 is used to treat HER2-positive MBC that has progressed on trastuzumab and a taxane-based chemotherapy.
- **Cyclin dependent kinase 4 and 6 (CDK4/6) inhibitors and hormone therapy** - new drugs designed to stop the growth of cancer cells. The CDK4/6 inhibitor palbociclib (Ibrance) with hormone therapy is used to treat hormone receptor-positive, HER2-negative MBC.
- **Everolimus (Afinitor) and other mTOR (mammalian target of rapamycin) inhibitors** - drugs that may increase the benefit of hormone therapy. The mTOR inhibitor everolimus (Afinitor) is used to treat hormone receptor-positive, HER2/neu-negative MBC in postmenopausal women who have been treated with an aromatase inhibitor.

Questions to ask your doctor

- What are my treatment options?
- Is targeted therapy right for me?
- What are the side effects and risks of the therapy you recommend for me?
- Is there a clinical trial I could join?

Resources

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BreastCancerTrials.org
415-476-5777
www.breastcancertrials.org

National Cancer Institute
1-800-4-CANCER
www.cancer.gov

Related fact sheets in this series:

- Clinical Trials
- Making Breast Cancer Treatment Decisions
- Types of Breast Cancer Tumors

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