Klose Training
Lymphedema Certification

Medical Oncology Treatments

Table of Contents

Klose Training

Medical Oncology Treatments

Jodi Winicour PT, CMT, CLT-LANA

GENERAL INFORMATION

Chemotherapy

"The systemic (whole body) treatment of cancer with anticancer drugs. The main purpose of chemotherapy is to kill cancer cells. It can be used as the primary form of treatment or as a supplement to other treatments. Chemotherapy is often used to treat patients with cancer that has spread from the place in the body where it started (metastasized), but it may also be used the keep cancer from coming back (adjuvant therapy). Chemotherapy destroys cancer cells anywhere in the body. It even kills cells that have broken off from the main tumor and traveled through the blood or lymph systems to other parts of the body."

The American Heritage® Dictionary of the English Language, Fourth Edition Copyright © 2004, 2000 by Houghton Mifflin Company. Published by Houghton Mifflin Company

Chemotherapy for breast cancer is most often given intravenously or orally.

Targeted Therapy for Breast Cancer

As researchers have learned more about changes in cancer cells that cause them to grow out of control, they've developed new types of drugs that target some of these cell changes. These targeted drugs are designed to block the growth and spread of cancer cells. These drugs work differently from chemotherapy drugs, which attack all cells that are growing quickly (including cancer cells).

Targeted drugs sometimes work even when chemo drugs do not. Some targeted drugs can help other types of treatment work better. Targeted drugs also tend to have different side effects than chemo.

Targeted Therapy for HER2-Positive Breast Cancer

For about 1 in 5 women with breast cancer, the cancer cells have too much of a growth-promoting protein known as HER2/neu (or just HER2) on their surface. These cancers, known as HER2-positive breast cancers, tend to grow and spread more aggressively. A number of drugs have been developed that target this protein:

- **Trastuzumab (Herceptin):** This is a monoclonal antibody, which is a man-made version of a very specific immune system protein. It is often given along with chemo, but it might also be used alone (especially if chemo alone has already been tried). Trastuzumab can be used to treat both early- and late-stage breast cancer. When started before or after surgery to treat early breast cancer, this drug is usually given for a total of 6 months to a year. For advanced breast cancer, treatment is often given for as long as the drug is helpful. This drug is given into a vein (IV).

- **Pertuzumab (Perjeta):** This monoclonal antibody can be given with trastuzumab and chemo, either before surgery to treat early-stage breast cancer, or to treat advanced breast cancer. This drug is given into a vein (IV).
- **Ado-trastuzumab emtansine (Kadcyla, also known as TDM-1):** This is a monoclonal antibody attached to a chemotherapy drug. It is used by itself to treat advanced breast cancer in women who have already been treated with trastuzumab and chemo. This drug is also given in a vein (IV).
- **Lapatinib (Tykerb):** This is a kinase inhibitor. It is a pill taken daily. Lapatinib is used to treat advanced breast cancer, and might be used along with certain chemotherapy drugs, trastuzumab, or hormone therapy drugs.
- **Neratinib (Nerlynx):** This is another kinase inhibitor. It is a pill that is taken daily. Neratinib is used to treat early-stage breast cancer after a woman has completed one year of trastuzumab and is usually given for one year. Some clinical trials show that it may also be effective in advanced breast cancer, as well.

Side Effects of Targeted Therapy for HER2-Positive Breast Cancer

The side effects of these drugs are often mild, but some can be serious. Discuss what you can expect with your doctor.

Some women develop heart damage during or after treatment with trastuzumab, pertuzumab, or ado-trastuzumab emtansine. This can lead to congestive heart failure. For most (but not all) women, this effect lasts a short time and gets better when the drug is stopped. The risk of heart problems is higher when these drugs are given with certain chemo drugs that also can cause heart damage, such as doxorubicin (Adriamycin) and epirubicin (Ellence). Because these drugs can cause heart damage, doctors often check your heart function (with an echocardiogram or a MUGA scan) before treatment, and again while you are taking the drug. Let your doctor know if you develop symptoms such as shortness of breath, leg swelling, and severe fatigue.

Lapatinib and neratinib can cause severe diarrhea, so it's very important to let your health care team know about any changes in bowel habits as soon as they happen. Lapatinib can also cause hand-foot syndrome, in which the hands and feet become sore and red, and may blister and peel. Pertuzumab can also cause diarrhea.

Targeted Therapy for Hormone Receptor-Positive Breast Cancer

About 2 of 3 breast cancers are hormone receptor-positive (ER-positive or PR-positive). For women with these cancers, treatment with hormone therapy is often helpful. Certain targeted therapy drugs can make hormone therapy even more effective, although these targeted drugs might also add to the side effects.

CDK4/6 Inhibitors

Palbociclib (Ibrance), ribociclib (Kisqali), and abemaciclib (Verzenio)

These are drugs that block proteins in the cell called cyclin-dependent kinases (CDKs), particularly CDK4 and CDK6. Blocking these proteins in hormone receptor-positive breast cancer cells helps stop the cells from dividing. This can slow cancer growth.

These drugs are approved for women with advanced hormone receptor-positive, HER2-negative breast cancer and are taken as pills, typically once or twice a day.

There are different ways to use these drugs.

- Any of the three drugs can be given along with an aromatase inhibitor (such as letrozole) or fulvestrant to women who have gone through menopause.
- Palbociclib or abemacilib can be given with fulvestrant to women who are still having regular periods (premenopausal) or are almost in menopause (perimenopausal). These women, however, must also be on medicines, such as luteinizing hormone-releasing hormone (LHRH) analogs, that stop the ovaries from making estrogen.
- Abemaciclib can also be used by itself in women who have previously been treated with hormone therapy and chemotherapy.
- Ribociclib can be given with an aromatase inhibitor to women who have not gone through menopause. Again, these women must also be on medicines that supprress the ovaries, such as a luteinizing hormone-releasing hormone (LHRH) analogs.

Side effects of these drugs tend to be mild. The most common side effects are low blood cell counts and fatigue. Nausea and vomiting, mouth sores, hair loss, diarrhea, and headache are less common side effects. Very low white blood cell counts can increase the risk of serious infection.

Everolimus (Afinitor)

Everolimus is used for women who have gone through menopause and have advanced hormone receptor-positive, HER2-negative breast cancer. It is used along with the aromatase inhibitor exemestane (Aromasin) for women whose cancers have grown while being treated with either letrozole or anastrozole (or if the cancer started growing shortly after treatment with these drugs was stopped).

This targeted therapy drug blocks mTOR, a protein in cells that normally helps them grow and divide. Everolimus may also stop tumors from developing new blood vessels, which can help limit their growth. In treating breast cancer, this drug seems to help hormone therapy drugs work better. Everolimus is a pill that is taken once a day.

Common side effects of everolimus include mouth sores, diarrhea, nausea, feeling weak or tired, low blood counts, shortness of breath, and cough. Everolimus can also increase blood lipids (cholesterol and triglycerides) and blood sugars, so your doctor will check your blood work periodically while you are taking this drug. It can also increase your risk of serious infections, so your doctor will watch you closely for infection.

Everolimus is also being studied for use in earlier-stage breast cancer, with other hormone therapy drugs, and in combination with other treatments.

Targeted Therapy for Women with BRCA Gene Mutations

Olaparib (Lynparza) is a type of drug known as a *PARP inhibitor*. PARP proteins normally help repair damaged DNA inside cells. The *BRCA* genes (*BRCA1* and *BRCA2*) also help repair DNA (in a slightly different way), but mutations in one of those genes can stop this from happening. PARP inhibitors work by blocking the PARP proteins. Because tumor cells with a mutated *BRCA* gene already have trouble repairing damaged DNA, blocking the PARP proteins often leads to the death of these cells.

Olaparib can be used to treat metastatic, HER2-negative breast cancer in women with a *BRCA* mutation who have already gotten chemotherapy (and hormone therapy if the cancer is hormone receptor-positive). Only a small portion of women with breast cancer have a mutated *BRCA* gene. If you are not known to have a *BRCA* mutation, your doctor will test your blood to be sure you have one before starting treatment with this drug.

This drug comes in pills that are taken once a day.

Side effects can include nausea, vomiting, diarrhea, fatigue, loss of appetite, taste changes, low red blood cell counts (anemia), belly pain, and muscle and joint pain. Rarely, some people treated with a PARP inhibitor have developed a blood cancer, such as myelodysplastic syndrome or acute myeloid leukemia (AML).

Source: Targeted Therapy for Breast Cancer. Retrieved from https://www.cancer.org/cancer/breast-cancer/treatment/targeted-therapy-for-breast-cancer.html. July 29, 2018.

Immunotherapy

Immunotherapy medicines use the power of the body's immune system to attack cancer cells.

The immune system is made up of a number of organs, tissues, and cells that work together to protect you from foreign invaders that can cause disease. When a disease- or infection-causing agent, such as a bacterium, virus, or fungus, gets into the body, the immune system reacts and works to kill the invaders. This self-defense system works to keep you from getting sick.

Cancer immunotherapy medicines work by helping the immune system work harder or more efficiently to fight cancer cells. Immunotherapy uses substances -- either made naturally by the body or man-made in a lab -- to boost the immune system to:

- Stop or slow cancer cell growth
- Stop cancer cells from spreading to other parts of the body
- Be better at killing cancer cells

To start an immune system response to a foreign invader, the immune system has to be able to tell the difference between cells or substances that are "self" (part of you) versus "non-self" (not part of you and possibly harmful). The body's cells have proteins on their surfaces or inside them that help the immune system recognize them as "self." This is part of the reason the immune system usually doesn't attack your body's own tissues. (Autoimmune disorders happen when the immune system mistakenly attacks your own tissues, such as the thyroid gland, joints, connective tissue, or other organs.)

"Non-self" cells have proteins and other substances on their surfaces and inside them that the body doesn't recognize, called antigens. Foreign antigens trigger the immune system to attack them and the cells they are in or on, whether viruses, bacteria, or infected cells. This response either destroys the foreign invaders or keeps them in check so they can't harm the body.

So why doesn't the immune system attack breast cancer cells on its own, without the help of immunotherapy medicines? There are two main reasons:

- **A breast cancer cell starts out as a normal, healthy cell.** A cancerous growth is a collection of cells that were once normal and healthy. Precancerous and even early breast cancer cells don't look that much different from normal cells. They don't shout "non-self" in the way that bacteria, viruses, and other foreign materials do -- which makes things more challenging for the immune system. But as cells transform into cancer, they do create proteins that the immune system sees as "foreign" antigens. In some cases, the immune

system is able to recognize some cancer cells as harmful and stop the process before a cancer can grow further.

- **As a cancer develops, the cancerous cells develop the ability to avoid the immune system.** Breast cancer doesn't happen overnight; it develops over a period of time. As healthy cells gradually change into cancer cells, the genetic information inside them is constantly changing. Some of these genetic changes allow the cancer cells to avoid detection by the immune system. Other changes allow cancer cells to speed up their growth rate and multiply much more quickly than normal cells do. This process can overwhelm the immune system and allow the breast cancer to grow unchecked.

In general, immunotherapy medicines can be divided into two main groups:

- **Active immunotherapies**, which stimulate your immune system to respond to the cancer. Cells from a cancer are examined in the lab to find antigens specific to that tumor. Then an immunotherapy treatment is created that makes the immune system target those antigens. Cancer vaccines and adoptive cell therapy are examples of active immunotherapies.
- **Passive immunotherapies**, which give the body man-made immune system components to help it fight cancer. Passive immunotherapies don't stimulate your immune system to actively respond the way active immunotherapies do. Immune checkpoint inhibitors and cytokines are examples of passive immunotherapies.

Because immunotherapy medicines help the immune system to kill cancer, the process can take a long time. Right now, it's not clear how long someone should be treated with immunotherapy. Many experts believe that combining immunotherapies, for example a vaccine with a checkpoint inhibitor, may be a good way to jump start a strong immune response to cancer. It's also likely that immunotherapies will be combined with other cancer treatments, such as targeted therapies.

While there are many types of immunotherapies being studied, some of the most relevant to breast cancer treatment are:

- cancer vaccines
- adoptive cell therapy
- immune checkpoint inhibitors
- immune targeted therapies
- cytokines

Right now, there are three targeted immunotherapies approved by the U.S. Food and Drug Administration (FDA) to treat breast cancer: Herceptin (chemical name: trastuzumab), Perjeta (chemical name: pertuzumab), and Kadcyla (chemical name: T-DM1 or ado-trastuzumab emtansine). These three medicines treat HER2-positive breast cancer by targeting the HER2 receptors on breast cancer cells.

Scientists are studying the immunogenicity of breast cancer -- how to provoke the immune system to respond to breast cancer -- as well specific immunotherapies. Stay tuned to Breastcancer.org for the latest updates.

Source: What is Immunotherapy? Retrieved from https://www.breastcancer.org/treatment/immunotherapy/what. Accessed 7/29/2018*.*

Chemotherapeutics in sweat

Excretion of chemotherapeutics via sweat is well established, but its overall significance as a secondary exposure route for others is not. That chemotherapeutics are excreted via sweat is reflected by its becoming recognized as a primary cause of a variety of adverse cutaneous effects during chemotherapy (e.g., doxorubicin), including hand-foot syndrome (hand-foot skin reaction) [47,48] and hyperpigmentation and alterations to nails. The specific formulation can enhance the excretion of the API via sweat.

But with respect to unanticipated exposure, this route of excretion holds the potential for promoting subsequent incidental exposures for others and poses higher risks than for other drugs because of the extreme cytotoxicity and mutagenicity of oncolytics. Excretion via sweat undoubtedly also plays a role in the development of hypersensitivity to certain other drugs because it ensures skin contact with drugs not intended for dermal application.

Early studies indirectly measured the excretion of chemotherapeutics via sweat by mutagenicity assays. For example, a 1988 study showed that sweat collected from patients treated with cyclophosphamide and other antineoplastics showed greater mutagenicity than controls 8 h after treatment [49]. A mean concentration of methotrexate in sweat was measured as 725 ng/ml (mean maximal concentration of 1.7 µg/ml), calculated as translating into excretion of 300 µg per day through sweat [50]. Other studies provide strong indirect evidence that sweat conveys chemotherapeutics outside the body. These studies have focused on studies of occupational exposure [51], where bedding becomes contaminated and serves as a route of exposure for health care workers and especially those working outside hospitals, such as home care providers [52]; workers in laundry facilities were noted as having the potential for higher exposures to antineoplastics than oncology nurses during the handling of bed sheets.

Daughton CG[1], Ruhoy IS. Environmental footprint of pharmaceuticals: the significance of factors beyond direct excretion to sewers. Environ Toxicol Chem. 2009 Dec;28(12):2495-521.

Common Chemotherapy Combinations

- CMF: cyclophosphamide (Cytoxan), methotrexate (Amethopterin, Mexate, Folex), and 5-fluorouracil (Fluorouracil, 5-FU, Adrucil)
- CAF (FAC): cyclophosphamide, doxorubicin (Adriamycin), and 5-fluorouracil
- AC: doxorubicin (Adriamycin) and cyclophosphamide
- EC: epirubicin (Ellence) and cyclophosphamide
- TAC: docetaxel (Taxotere), doxorubicin (Adriamycin), and cyclophosphamide
- AC --> T: doxorubicin (Adriamycin) and cyclophosphamide followed by paclitaxel (Taxol) or docetaxel (Taxotere)
- A --> CMF: doxorubicin (Adriamycin), followed by CMF
- A CEF (FEC): cyclophosphamide, epirubicin, and 5-fluorouracil (with or without docetaxel)
- TC: docetaxel (Taxotere) and cyclophosphamide
- GT: gemcitabine (Gemzar) and paclitaxel (Taxol)

Some other chemotherapy drugs used for treating women with breast cancer include carboplatin (Paraplatin), cisplatin (Platinol), vinorelbine (Navelbine), capecitabine (Xeloda), pegylated liposomal doxorubicin (Doxil), and albumin-bound paclitaxel (Abraxane).

February 23, 2008. American Cancer Society. Detailed Guide: Breast Cancer. www.cancer.org.

Hormone/Endocrine Therapy

- "Approximately seven in ten breast cancer patients have estrogen receptor positive tumors and so are candidates for endocrine therapy."[1]
- The growth of estrogen receptor-positive breast cancer cells can be prevented or slowed by reducing the exposure to estrogen.
- Endocrine treatment is now emerging as an attractive alternative in hormone receptor-positive postmenopausal and mainly elderly women, several of whom cannot tolerate the toxicities of chemotherapy.
- Tamoxifen reduces estrogen exposure by blocking hormone receptors.
- Drugs known as aromatase inhibitors reduce estrogen exposure by inhibiting the production of estrogen in tissues outside of the ovaries.
- In premenopausal women, who have high levels of estrogen produced by the ovaries, suppression of ovarian hormone production is another approach to reducing estrogen exposure.
- "A possible advantage of using an LHRH agonist to induce ovarian suppression is that the effect may be reversible when the patient stops taking the drug… which may allow the woman to become pregnant."[2]
- Drugs known as leuteinizing hormone releasing hormone (LHRH) agonists, such as Zoladex® (goserelin), suppress hormone production by the ovaries.

TAILORx Trial 2018

Most Women with Early-Stage Breast Cancer Can Forgo Chemotherapy When Guided by a Diagnostic Test

CHICAGO – A federally funded phase III clinical trial shows that most women with hormone receptor-positive, HER2-negative, axillary node-negative early-stage breast cancer and a mid-range score on a 21-tumor gene expression assay (Oncotype DX® Breast Recurrence Score) do not need chemotherapy after surgery. The study found no improvement in disease-free survival when chemotherapy was added to hormone therapy in this group, which accounts for about two-thirds of women who participated in the trial. The findings will have an immediate impact on clinical practice, sparing thousands of women the side effects of chemotherapy.

The study will be presented in ASCO's Plenary Session, which features four studies deemed to have the greatest potential to impact patient care, out of the more than 5,800 abstracts featured as part of the 2018 American Society of Clinical Oncology (ASCO) Annual Meeting. This is the largest breast cancer treatment trial ever conducted, and the first precision medicine trial ever done, according to the authors.

"Half of all breast cancers are hormone receptor-positive, HER2-negative, and axillary node-negative. Our study shows that chemotherapy may be avoided in about 70 percent of these women when its use is guided by the test, thus limiting chemotherapy to the 30 percent who we can predict will benefit from it," said lead study author Joseph A. Sparano, MD, Associate Director for Clinical Research at the Albert Einstein Cancer Center and Montefiore Health System in New York, and Vice-Chair of the ECOG-ACRIN Cancer Research Group.

"Before TAILORx, there was uncertainty about the best treatment for women with a mid-range score of 11-25 on the Oncotype DX Breast Recurrence Score test. The trial was designed to address this question, and provides a very definitive answer," said Dr. Sparano. "Any woman with early-stage breast cancer 75 years or younger should have the test and discuss the results of TAILORx with her doctor to guide her decision regarding chemotherapy after surgery to prevent recurrence," said Dr. Sparano.

Based on evidence from several prior studies, the 21-gene expression assay is widely used to provide prognostic information about the risk of breast cancer recurrence within 10 years, and to predict which patients are most likely to derive a large benefit from chemotherapy. The test is performed on a tumor biopsy sample. Women with a low score (0-10) typically receive only hormone therapy and those with a high score (26-100) receive hormone therapy and chemotherapy.

Side effects of chemotherapy for breast cancer can be significant. Short-term side effects that occur during chemotherapy include nausea, vomiting, hair loss, fatigue, and infection, and, in younger women, early menopause or infertility. Neuropathy is another common side effect, with symptoms including numbness, tingling, or pain in the hands and feet, which may sometimes be permanent. Certain delayed side effects that may occur months or years after chemotherapy are rare, but potentially serious, including heart failure and leukemia.

About the Study

The **T**rial **A**ssigning **I**ndividua**L**ized **O**ptions for **TR**eatment (TAILORx) (ClinicalTrials.gov Identifier: NCT00310180) enrolled 10,273 women with hormone receptor-positive, HER2-negative, axillary node-negative breast cancer -- the most common type of breast cancer. Of those, 6,711 had a mid-range recurrence score of 11-25 and were randomly assigned to receive hormone therapy alone or hormone therapy and chemotherapy.

The primary endpoint was disease-free survival, defined as recurrence of cancer in the breast, regional lymph nodes and/or distant organs, a second primary cancer in the opposite breast or another organ, or death from any cause.

Key Findings

At a median follow-up of 7.5 years, the study met its primary pre-specified endpoint indicating that hormone therapy alone was not less effective than chemotherapy plus hormone therapy in women with a Breast Recurrence Score of 11-25. Nine-year rates were similar in the two treatment arms for disease-free survival (83.3% vs. 84.3%), distant recurrence (94.5% vs. 95.0%), and overall survival (93.9% vs. 93.8%), indicating no benefit from adding chemotherapy to hormone therapy. Another important finding was identification of the group that did have some chemotherapy benefit – women 50 years or younger who had a Breast Recurrence Score of 16-25.

The researchers also found that women with a recurrence score of 10 or less had very low recurrence rates with hormone therapy alone, irrespective of age or other clinical factors. In addition, those with a recurrence score of 26 or higher had a distant recurrence rate of 13% despite chemotherapy and hormone therapy, indicating the need to develop more effective therapies for this group.

According to the authors, the findings suggest that chemotherapy may be spared in:

- All women older than 50 years with hormone-receptor positive, HER2-negative, node-negative breast cancer and a Recurrence Score of 0 to 25 (about 85% of women with breast cancer in this age group)

- All women 50 years or younger with hormone-receptor positive, HER2-negative, node-negative breast cancer and a Recurrence Score of 0 to 15 (about 40% of women with breast cancer in this age group)

This study received funding primarily from the National Cancer Institute, part of the National Institutes of Health. Additional support was provided by the Breast Cancer Research Foundation, Komen Foundation, and the U.S. Postal Service Breast Cancer Stamp. The ECOG-ACRIN Cancer Research Group designed and conducted the study.

2018 June. Most Women With Early Stage Breast Cancer Can Forgo Chemotherapy When Guided by a Diagnostic Test. Retrieved from https://www.asco.org/about-asco/press-center/news-releases/most-women-early-stage-breast-cancer-can-forgo-chemotherapy.

ASCO Updated Guidelines

on Ovarian Suppression After Surgery for Early-Stage, Hormone-Receptor-Positive Disease

The American Society of Clinical Oncology (ASCO) has put out updated guidelines on using ovarian suppression along with standard hormonal therapy medicine after surgery for premenopausal women diagnosed with early-stage, hormone-receptor-positive breast cancer.

The guidelines were published online on Feb. 16, 2016 by the *Journal of Clinical Oncology*. Read "Adjuvant Endocrine Therapy for Women With Hormone Receptor-Positive Breast Cancer: American Society of Clinical Oncology Clinical Practice Guideline Update on Ovarian Suppression."

Aromatase inhibitors weren't commonly used to reduce recurrence risk in premenopausal women. But a 2014 study, called the SOFT study, found that Aromasin plus ovarian suppression reduced recurrence risk more than tamoxifen plus ovarian suppression in premenopausal women diagnosed with early-stage, hormone-receptor-positive breast cancer who had been treated with chemotherapy. Ovarian suppression plus either type of hormonal therapy reduced recurrence risk more than tamoxifen alone after surgery for these women.

Breastcancer.org accessed 12/4/2016.

A common side effect of some hormonal therapies is loss of bone density. Drugs known as bisphosphonates may be able to prevent this bone loss.

[1] *National Cancer Institute Clinical Trial Results. Letrozole More Effective than Tamoxifen in Early Breast Cancer: Results from the BIG 1-98 Trial. 8/07/07.*

[2] *National Cancer Institute Clinical Trial Results. Ovary-Suppressing Drugs Can Prevent Return of Breast Cancer. 06/27/07.*

December 14, 2006 © 2006 The Susan G. Komen Breast Cancer Foundation (above)

HER2

- Approximately 25 to 30% of breast cancers overexpress (make too much of) a protein known as HER2.
- Overexpression of this protein leads to increased growth of cancer cells and a worse breast cancer prognosis. Fortunately, the development of treatments that specifically target HER2-positive cells has improved prognosis for women with HER2-positive breast cancer.
- Herceptin is an agent that recognizes and binds to HER2-positive cells.
- The effects of Herceptin are thought to include decreased cell growth and increased cell death.

- Use of Herceptin was initially evaluated in women with metastatic breast cancer; in these women, treatment with chemotherapy plus Herceptin slowed cancer progression and improved survival compared to treatment with chemotherapy alone.
- Herceptin was first approved for the treatment of metastatic breast cancer in 1998.

  © 2006 The Susan G. Komen Breast Cancer Foundation

- According to results recently presented at the 2007 annual San Antonio Breast Cancer Symposium, the combination of Omnitarg™ (pertuzumab) plus Herceptin® (trastuzumab) provides significant anticancer activity among women with human epidermal growth factor receptor 2 (HER2)-positive breast cancer whose disease had progressed while on therapy with Herceptin alone.

  © 2008 The Susan G. Komen Breast Cancer Foundation

Adjuvant Breast Cancer Treatment

Clinical Study Results: Four pivotal trials involving more than 10,000 women demonstrated that 1 year of Herceptin therapy provided significant clinical benefit.[1]

Herceptin is indicated for adjuvant treatment of HER2-overexpressing node-positive or node-negative (ER/PR-negative or with one high-risk feature*) breast cancer:

- As part of a treatment regimen containing doxorubicin, cyclophosphamide, and either paclitaxel or docetaxel
- With docetaxel and carboplatin
- As a single agent following multi-modality anthracycline-based therapy

* High-risk is defined as ER/PR positive with one of the following features: tumor size >2 cm, age <35 years, or tumor grade 2 or 3.

Available at: http://www.herceptin.com/hcp/treatment/adjuvant/index.html. Accessed 2/25/2012

BRCA 1 & 2

- Inherited mutations in two genes—BRCA1 and BRCA2—have been found to greatly increase the lifetime risk of developing breast and ovarian cancer. Alterations in these genes can be passed down through either the mother's or the father's side of the family.
- Women with these mutations have a 60 to 85% risk of developing breast cancer and a 15 to 65% risk of developing ovarian cancer by age 70.
- Among women with a BRCA1 or BRCA2 mutation, an important goal of research is to identify treatments, screening tools, and behavioral changes that can reduce the risk of developing breast cancer or improve early detection of cancer.
- There is mounting evidence supporting preventative surgical removal of both ovaries "in carriers of BRCA mutations as an effective way of reducing the risk of both ovarian and breast cancer."
- Women with a BRCA1 or BRCA2 mutation who develop breast cancer in one breast have a high risk of subsequently developing breast cancer in the other breast as well. One approach to managing this increased risk is to undergo prophylactic contralateral mastectomy (preventive removal of the opposite breast).

Nancer Cancer Institute Clinical Trial Results. Preventative Surgery Can Reduce Cancer Risk in Women with BRCA Gene Mutations. 10/04/06.

Tumor Genomic Assays

Tumor genomic assays (or tests) analyze a sample of a cancer tumor to see how active certain genes are. The activity level of these genes affects the behavior of the cancer, including how likely it is to grow and spread. Genomic tests are used to help make decisions about whether more treatments after surgery would be beneficial.

While their names sound similar, genomic testing and genetic testing are very different.

Genetic testing is done on a sample of your blood, saliva, or other tissue and can tell you if you have an abnormal change (also called a mutation) in a gene that is linked to a higher risk of breast cancer.

There are several tests used to analyze the genes in a breast cancer to help predict whether the breast cancer will come back (recurrence). All of the tests can be done on a sample of preserved tissue that was removed from the breast during the original biopsy or surgery.

The differences between the tests are explained below. To learn about each in more detail, click the link for each test.

- The **Breast Cancer Index test** analyzes the activity of seven genes to help predict the risk of node-negative, hormone-receptor-positive breast cancer coming back 5 to 10 years after diagnosis. The test can help women and their doctors decide if extending hormonal therapy 5 more years (for a total of 10 years of hormonal therapy) would be beneficial.

  The Breast Cancer Index reports two scores: how likely the cancer is to recur 5 to 10 years after diagnosis and how likely a woman is to benefit from taking hormonal therapy for a total of 10 years.

  The Breast Cancer Index test is not approved by the FDA but may be covered by some insurance companies.

- The **EndoPredict test** is used to predict the risk of distant recurrence of early-stage, hormone-receptor-positive, HER2-negative breast cancer that is either node-negative or has up to three positive lymph nodes.

  The EndoPredict test analyzes 12 genes to see how active they are, and then combines that risk score with the cancer's size and nodal status to calculate an EPclin Score that categorizes the cancer as having either a high risk or low risk of distant recurrence. The EndoPredict test is sold as a kit to local pathology labs, rather than done as a centralized laboratory service like some of the other genomic tests. The EndoPredict test is not approved by the U.S. Food and Drug Administration (FDA) and is only available in Europe.

- The **MammaPrint test** analyzes 70 genes to see how active they are and then calculates either a high-risk or a low-risk recurrence score.

  Research suggests the MammaPrint test eventually may be widely used to make treatment decisions based on the recurrence risk of early-stage, hormone-receptor-positive or hormone-receptor-negative disease. *(See p. 13 – 14 for more information about the MammaPrint.)*

- The **Mammostrat test** measures the levels of five genes in breast cancer cells. These measurements are used to calculate a risk index score. Women are assigned to a risk category (high, moderate, or low) based on their risk index score.

  Research suggests the Mammostrat test eventually may be widely used to make treatment decisions based on the recurrence risk of early-stage, hormone-receptor-positive disease.

- The **Oncotype DX test** is used to estimate a woman's risk of recurrence of early-stage, hormone-receptor-positive breast cancer, as well as how likely she is to benefit from chemotherapy after breast cancer surgery.

  The Oncotype DX DCIS test analyzes the activity of 12 genes and then estimates a woman's recurrence risk of DCIS (ductal carcinoma in situ) and/or the risk of a new invasive cancer developing in the same breast, as well as how likely she is to benefit from radiation therapy after DCIS surgery.

  The Oncotype DX test analyzes the activity of 21 genes and then calculates a recurrence score number between 0 and 100; the higher the score, the greater the risk of recurrence of an invasive breast cancer.

  Of the genomic tests used on breast cancer, the Oncotype DX test has the most thorough data supporting its use to make treatment decisions. Because of this strong research, the Oncotype DX test is the most common test used in the United States to make treatment decisions. *(See the following page for more information on the Oncotype DX test.)*

- The **Prosigna Breast Cancer Prognostic Gene Signature Assay** analyzes the activity of 58 genes and calculates a risk of recurrence score (low, intermediate, or high).

  Research suggests the Prosigna assay eventually may be used more frequently to make treatment decisions based on the risk of distant recurrence (cancer coming back in a part of the body away from the breast) within 10 years of diagnosis of early-stage, hormone-receptor positive disease with up to three positive lymph nodes after 5 years of hormonal therapy treatment in postmenopausal women.

Whichever test you have, you and your doctor will consider your scores in combination with the other information in your pathology report, such as:

- size and grade of the cancer
- hormone receptor protein levels
- whether cancer cells were found in nearby lymph nodes

Tumor Genomic Assays. Retrieved from https://www.breastcancer.org/symptoms/diagnosis/genomic_assays July 29, 2018

Gene Signatures Linked with Response to Neoadjuvant Chemotherapy for Breast Cancer

- Among women with estrogen receptor-negative, operable breast cancer, use of gene expression profiling may help physicians select the most appropriate neoadjuvant (before surgery) chemotherapy regimen. These results were published in Lancet Oncology.
- Because not all women respond to chemotherapy, and because some women respond to one type of chemotherapy but not another, researchers have evaluated different approaches to predicting chemotherapy response. The goal is more individualized cancer therapy. If it can be determined in advance that a woman is unlikely to respond to a particular treatment, she can avoid the time and side effects involved with that treatment, and choose a different approach.

- A tool that's contributing to more individualized cancer therapy is gene expression profiling. Gene expression profiling explores the patterns of genes that are active in tumor cells. Studies suggest that gene expression may provide information about prognosis or likely response to treatment in several types of cancer.
- To explore gene expression and response to two different neoadjuvant chemotherapy regimens, researchers in Europe evaluated information from 125 women with large, operable, estrogen receptor-negative breast cancer. Women received neoadjuvant chemotherapy with either fluorouracil, epirubicin, and cyclophosphamide (FEC); or docetaxel followed by epirubicin plus docetaxel (TET).
- The researchers were able to confirm that gene signatures that they'd identified previously did in fact predict response to each of these chemotherapy regimens. Some women had gene signatures predictive of response to FEC, some women had gene signatures predictive of response to TET, and some women had gene signatures that predicted that neither regimen would be effective. This information may eventually help physicians select the most appropriate chemotherapy regimen for a given woman.
- This study provides additional evidence that gene expression profiling may lead to more individualized, and ultimately more effective, cancer therapy.

Reference: *Bonnefoi H, Potti A, Delorenzi M et al. Validation of gene signatures that predict the response of breast cancer to neoadjuvant chemotherapy: a substudy of the EORTC 10994/BIG 00-01 clinical trial. Lancet Oncology [early online publication]. November 14, 2007.*

Oncotype DX Breast Cancer Assay

- Oncotype DX is a genomic test that provides a clearer picture of individual tumor biology.
- It helps determine which patients with newly diagnosed estrogen receptor-positive,
- HER2 (-) early stage invasive breast cancer may benefit from chemotherapy in addition to hormonal therapy.
- Oncotype DX predicts the patient's risk for experiencing a recurrence of cancer 10 years following diagnosis, as well as the likelihood that a patient will benefit from chemotherapy.
- Oncotype DX evaluates the activity of 21 genes from a sample of the patient's cancer and determines the patient's risk of a recurrence by a measure called the Recurrence Score™.
- The Recurrence Score ranges from 0 to 100, with a higher score indicating a greater risk of recurrence. It has been shown to provide intermediate or indeterminate results between 39 and 67% of the time depending on the study, which will not aide in treatment decisions.
- Is supported by data from studies with over 9000 patients.
- According to the results of a study presented at the 2007 San Antonio Breast Cancer Symposium, the Oncotype DX™ test may help guide chemotherapy decisions among women with node-positive, estrogen receptor-positive breast cancer.

Reference: Albain K, Barlow W, Shak S et al. Prognostic and predictive value of the 21-gene recurrence score assay in postmenopausal, node-positive, ER-positive breast cancer (S8814,INT0100). Presented at the 30th Annual San Antonio Breast Cancer Symposium. San Antonio, TX, December 13-16, 2007. Abstract #10.

MammaPrint®

- The United States Food and Drug Administration (FDA) has approved the microarray genetic analysis, the MammaPrint® test, to help predict the risk of cancer recurrences or spread of cancer among women with Stages I or II node-negative breast cancer in estrogen (+) and (-) cases.
- Although cure rates remain high following standard therapies for these patients, a significant portion will experience a recurrence of their breast cancer.
- Researchers continue to evaluate ways to identify women who are at a higher risk of a recurrence and may benefit from additional therapy. This would also allow patients who are at a low risk of a recurrence to forego therapy associated with side effects and still maintain optimal outcomes.
- MammaPrint measures the activity of 70 genes from tissue samples of a patient's cancer.
- Based on the activity of these genes, calculations are made to predict the likelihood that the patient will experience a recurrence or metastasis (spread to distant sites in the body).
- Women classified as "high-risk" are at approximately twice the risk of developing a recurrence as those classified as "low-risk" according to results from MammaPrint. There is no indeterminate or intermediate result, unlike Oncotype DX. However, researchers caution that the predictive value of results from MammaPrint are not reliable on their own in determining treatment for a patient; MammaPrint results should instead be considered along with a patient's other clinical data when making treatment decisions.
- In addition, the test appears better at determining which women are at a low risk of developing a recurrence than determining which are at a high risk of developing a recurrence.
- Recent results from the MINDACT clinical trial sowed that 46% of patients identified as high risk for recurrence according to routine clinical pathological assessment who would have been candidates for adjuvant chemotherapy, were reclassified as low risk by MammaPrint® and may be able to safely forego chemotherapy.
- MammaPrint® also identifies the molecular subtype of the cancer as Luminal A, Luminal B, Basal and HER2-positive.

Triple Negative Breast Cancer

- According to the results of a study published in the Journal of Clinical Oncology, women with early-stage breast cancer that is estrogen receptor-negative, progesterone receptor-negative, and HER2-negative (triple negative breast cancer) are more likely than other women to develop distant metastases.
- Women with triple negative breast cancer did not, however, have an increased risk of local recurrence.

  November 27, 2006© 2006 The Susan G. Komen Breast Cancer Foundation
- Standard therapy for triple-negative metastatic breast cancers typically includes chemotherapy utilizing agents in the anthracycline and taxane classes. Typically used anthracyclines include Adriamycin® (doxorubicin), Ellence® (epirubicin), and Doxil® (pegylated liposomal doxorubicin), and typically used taxanes include Taxol® (paclitaxel) and

Taxotere® (docetaxel). Because patients whose cancer progressed despite treatment with anthracyclines and/or taxanes are left with limited options, researchers continue to evaluate novel therapies to improve their outcomes.

- Many patients are now receiving neoadjuvant chemotherapy including Herceptin for HER2(+) Triple (-) BrCAs.
- Researchers recently conducted a clinical trial evaluating the newly approved chemotherapy agent Ixempra plus Xeloda for the treatment of triple-negative metastatic breast cancer. This trial included 752 patients whose cancer had progressed despite therapy with anthracyclines and/or taxanes. Patients were treated with either Ixempra plus Xeloda or Xeloda only.
- Anticancer responses were achieved in 27% of patients treated with Ixempra/Xeloda compared with only 9% for those treated with Xeloda only.
- Progression-free survival was doubled among patients treated with Ixempra/Xeloda compared with those treated with Xeloda only.
- The combination of Ixempra and Xeloda was well tolerated.
- The researchers concluded that the combination of Ixempra and Xeloda provides improved anticancer response rates and improved progression-free survival compared with Xeloda alone in the treatment of triple-negative metastatic breast cancer that has stopped responding to prior therapy with anthracyclines and/or taxanes.

Reference: Rugo HS, Thomas ES, Lee RK, Fein LE, Peck R, Verrill M. Combination therapy with the novel epothilone B analog, ixabepilone, plus capecitabine has efficacy in ER/PR/HER2-negative breast cancer resistant to anthracyclines and taxanes. Program and abstracts of the 30th Annual San Antonio Breast Cancer Symposium; December 13-16, 2007; San Antonio, Texas. Abstract 6069.

Cancer/Chemotherapy-Related Cognitive Impairment

- Patients undergoing chemotherapy have long complained of a phenomenon commonly known as “chemo-brain.” Chemo-brain refers to changes in cognitive function, such as loss of memory and inability to think clearly or perform some daily functions. Researchers have not been able to pinpoint the cause of these changes, but current studies are evaluating brain structure and function in order to better understand the effects of chemotherapy on the brain.
- A symposium titled “Chemotherapy-related Cognitive Dysfunction: An Emerging Area of Translational Research” brought together neuroscientists and oncologists to discuss the effects of chemotherapy on the brain and cognitive function. The discussion focused on the subset of patients who experience persistent cognitive problems, often consisting of problems with memory and concentration. Although these self-reported problems are not always apparent on neuropsychological testing, PET imaging of the brain suggests that chemotherapy may alter brain function. The way in which chemotherapy might affect the brain remains unclear, however. A direct toxic effect on the brain is one possibility, but cognitive dysfunction could also be influenced by chemotherapy-induced menopause or other mechanisms. In addition, it’s possible that genetic susceptibility plays a role in who develops cognitive dysfunction, and researchers are exploring various candidate genes. For breast cancer patients, it’s also important to determine how the combination of hormonal therapy and chemotherapy affects cognitive function, and this research is also underway.

  Program and abstracts of the 30th Annual San Antonio Breast Cancer Symposium; December 13-16, 2007; San Antonio, Texas.

- The role of chemotherapy neurotoxicity in the causation of cognitive deficits in cancer patients is… still unclear. Many other factors potentially leave traces in the brains of breast cancer patients and potentially affect on their cognitive functioning, among them surgery, radiotherapy, endocrine therapy, the psychological burden of having cancer, treatment related life disruption, and disease-related biological factors such as elevated cytokine levels; furthermore, shared vulnerability for cancer and cognitive deficits is being discussed (22). Patients who receive chemotherapy are clearly at an elevated risk of cognitive deficits, but not necessarily due to neurotoxic effects. These patients also have a more advanced cancer stage, with a worse prognosis and a greater psychological burden. In addition, undergoing chemotherapy is a frightening experience that in itself aggravates psychological burden and further disrupts life. Cognitive deficits in breast cancer patients may be caused by an accumulation of many of these factors.

  Hermelink, K. Chemotherapy and Cognitive Function in Breast Cancer Patients: The So-Called Chemo Brain. J Natl Cancer Inst Monogr (2015) 2015(51)

CHEMOTHERAPY AGENTS

NOTE: *Chemocare.com, the source of this information, uses generic names in all descriptions of drugs. Some health care professionals may use the trade name or alternate names in a familial way, like "Kleenex®" is used for tissues.*

NOTE: *The **nadir** listed with each of these agents is the time period between chemotherapy cycles during which you experience low blood counts.*

5-FU

Generic name: Fluorouracil
Trade name: Adrucil®
Other names: 5-fluorouracil

Drug type: 5-FU is an anti-cancer ("antineoplastic" or "cytotoxic") chemotherapy drug. This medication is classified as an "antimetabolite."

What 5-FU is used for:

- Colon and rectal cancer
- Breast cancer
- Gastrointestinal cancers including: anal, esphageal, pancreas and gastric (stomach)
- Head and neck cancer
- *Hepatoma (liver cancer)
- Ovarian cancer
- Topical use (cream or solution) in basal cell cancer of the skin and actinic keratoses. See document – fluorouracil (cream).

5-FU is given:

- As an injection into the vein (intravenous or IV), or as an infusion. The amount of time and schedule of infusion varies depending on a specific protocol, it may be given over several hours to several weeks.
- As a topical ointment, a thin coating is applied to the affected skin lesions twice a day, treatment may continue over several weeks. (see document fluorouracil(cream).
- The amount of 5-FU that you will receive depends on many factors, including your height and weight, your general health or other health problems, and the type of cancer or condition being treated. Your doctor will determine your dose and schedule.

Side effects – general information

- Most people do not experience all of the side effects listed.
- Side effects are often predictable in terms of their onset and duration.
- Side effects are almost always reversible and will go away after treatment is complete.
- There are many options to help minimize or prevent side effects.
- There is no relationship between the presence or severity of side effects and the effectiveness of the medication.

- The side effects of 5-FU and their severity depend a variety of factors including dosage, the individual's metabolism, other drugs given as part of a combination therapy, and/or the schedule and duration of treatment.
- Not all side effects are listed below. Some that are rare (occurring in less than 10% of patients) are not listed here. However, you should always inform your health care provider if you experience any unusual symptoms.
- *Always inform your health care provider if you experience any unusual symptoms.*

5-FU - Common side effects (occurring in greater than 30% of patients):

- Diarrhea
- Nausea and possible occasional vomiting
- Mouth sores
- Poor appetite
- Watery eyes, sensitivity to light (photophobia) (See eye problems.)
- Taste changes, metallic taste in mouth during infusion
- Discoloration along vein through which the medication is given.
- Low blood counts. White and red blood cells and platelets may temporarily decrease. This can put you at increased risk for infection, anemia and/or bleeding.
    - Onset**:** 7-10 days — Nadir: 9-14 days — Recovery: 21-28 days

5-FU - Less common side effects (occurring in about 10-29% of patients):

- Skin reactions: Dry, cracking, peeling skin. Darkening of the skin (hyperpigmentation), darkening of the skin where previous radiation treatment has been given (radiation recall).
- Hair thinning.
- Nail changes - discoloration, loss of nails (rare)(see skin reactions).
- Hand-foot syndrome (Palmar-plantar erythrodysesthesia or PPE) -skin rash, swelling, redness, pain and/or peeling of the skin on the palms of hands and soles of feet. Usually mild, starting 5-6 weeks after start of treatment. May require reductions in the dose of the medication.

Serious adverse reactions: Chest pain, EKG changes and increases in cardiac enzymes - which may indicate problems with the heart. These symptoms are very rare but increased for patients with a prior history of heart disease.

When to contact your doctor or health care provider:

Contact your health care provider ***immediately***, day or night, if you experience fever of 100.5º F (38º C) or higher and/or chills (possible signs of infection)

The following symptoms require medical attention, but are not an emergency. Contact your health care provider *within 24 hours* of noticing any of the following:

- Nausea (interferes with ability to eat and unrelieved with prescribed medication)
- Vomiting (vomiting more than 4-5 times in a 24 hour period)
- Diarrhea (4-6 episodes in a 24-hour period) despite anti-diarrhea medication and diet alterations.

- Unusual bleeding or bruising
- Black or tarry stools, or blood in your stools or urine
- Extreme fatigue (unable to carry on self-care activities)
- Mouth sores (painful redness, swelling or ulcers)
- Tingling or burning, redness, swelling of the palms of the hands or soles of feet

5-FU precautions:

- Before starting 5-FU treatment, make sure you tell your doctor about any other medications you are taking (including prescription, over-the-counter, vitamins, herbal remedies, etc.).
- Do not receive any kind of immunization or vaccination without your doctor's approval while taking 5-FU.
- Inform your health care professional if you are pregnant or may be pregnant prior to starting this treatment. Pregnancy category D (5-FU may be hazardous to the fetus. Women who are pregnant or become pregnant must be advised of the potential hazard to the fetus). For both men and women: Do not conceive a child (get pregnant) while taking 5-FU. Barrier methods of contraception, such as condoms, are recommended. Discuss with your doctor when you may safely become pregnant or conceive a child after therapy.
- Do not breast feed while taking this medication.

Self-care tips:

- Use of ice chips in the mouth 10-15minutes before and after IV injections of 5-FU may reduce the incidence and severity of mouth sores.
- To help treat/prevent mouth sores, use a soft toothbrush, and rinse three times a day with 1/2 to 1 teaspoon of baking soda and/or 1/2 to 1 teaspoon of salt mixed with 8 ounces of water.
- Drink at least two to three quarts of fluid every 24 hours, unless you are instructed otherwise.
- Follow regimen of anti-diarrhea medication as prescribed by your health care professional.
- Eat foods that may help reduce diarrhea (see managing side effects - diarrhea).
- You may be at risk of infection so try to avoid crowds or people with colds and/or not feeling well, and report fever or any other signs of infection immediately to your health care provider.
- Wash your hands often.
- To reduce nausea, take anti-nausea medications as prescribed by your doctor, and eat small, frequent meals.
- Avoid sun exposure. Wear SPF 15 (or higher) sunblock and protective clothing.
- Prevention of hand-foot syndrome. Modification of normal activities of daily living to reduce friction and heat exposure to hands and feet, for about a week after treatment. (for more information see - Managing side effects: hand foot syndrome).
- Keep palms of hands and soles of feet moist using emollients.
- You may experience drowsiness or dizziness; avoid driving or engaging in tasks that require alertness until your response to the drug is known.

- In general, drinking alcoholic beverages should be kept to a minimum or avoided completely. You should discuss this with your doctor.
- Get plenty of rest.
- Maintain good nutrition.
- If you experience symptoms or side effects, be sure to discuss them with your health care team. They can prescribe medications and/or offer other suggestions that are effective in managing such problems.

Monitoring and testing:

You will be checked regularly by your health care professional while you are taking 5-FU, to monitor side effects and check your response to therapy. Periodic blood work to monitor your complete blood count (CBC) as well as the function of other organs (such as your kidneys and liver) will also be ordered.

How 5-FU works:

Cancerous tumors are characterized by cell division, which is no longer controlled as it is in normal tissue. "Normal" cells stop dividing when they come into contact with like cells, a mechanism known as contact inhibition. Cancerous cells lose this ability. Cancer cells no longer have the normal checks and balances in place that control and limit cell division. The process of cell division, whether normal or cancerous cells, is through the cell cycle. The cell cycle goes from the resting phase, through active growing phases, and then to mitosis (division).

The ability of chemotherapy to kill cancer cells depends on its ability to halt cell division. Usually, the drugs work by damaging the RNA or DNA that tells the cell how to copy itself in division. If the cells are unable to divide, they die. The faster the cells are dividing, the more likely it is that chemotherapy will kill the cells, causing the tumor to shrink. They also induce cell suicide (self-death or apoptosis).

Chemotherapy drugs that affect cells only when they are dividing are called cell-cycle specific. Chemotherapy drugs that affect cells when they are at rest are called cell-cycle non-specific. The scheduling of chemotherapy is set based on the type of cells, rate at which they divide, and the time at which a given drug is likely to be effective. This is why chemotherapy is typically given in cycles.

Chemotherapy is most effective at killing cells that are rapidly dividing. Unfortunately, chemotherapy does not know the difference between the cancerous cells and the normal cells. The "normal" cells will grow back and be healthy but in the meantime, side effects occur. The "normal" cells most commonly affected by chemotherapy are the blood cells, the cells in the mouth, stomach and bowel, and the hair follicles; resulting in low blood counts, mouth sores, nausea, diarrhea, and/or hair loss. Different drugs may affect different parts of the body.

5-FU belongs to the category of chemotherapy called antimetabolites. Antimetabolites are very similar to normal substances within the cell. When the cells incorporate these substances into the cellular metabolism, they are unable to divide. Antimetabolites are cell-cycle specific. They attack cells at very specific phases in the cycle. Antimetabolites are classified according to the substances with which they interfere.

ADRIAMYCIN®

Generic name: Doxorubicin
Other brand name: Rubex®

Drug type: Adriamycin is an anti-cancer ("antineoplastic" or "cytotoxic") chemotherapy drug. This medication is classified as an "anthracycline antiobiotic."

What Adriamycin® is used for:

- Cancers treated with adriamycin include: bladder, breast, head and neck, leukemia (some types), liver, lung, lymphomas, mesothelioma, multiple myeloma, neuroblastoma, ovary, pancreas, prostate, sarcomas, stomach, testis (germ cell), thyroid, uterus.
- Note: If adriamycin has been approved for one use, physicians sometimes elect to use adriamycin for other problems if they believe it might be helpful.

Adriamycin® is given:

- Adriamycin is given through a vein by intravenous injection (IV). The syringe needle is placed directly into the vein or central line and the drug is given over several minutes. Adriamycin can also be given by continuous infusion. Rarely, adriamycin is given by injection into an artery. There is no pill form of adriamycin.
- Adriamycin is a vesicant. A vesicant is a chemical that causes extensive tissue damage and blistering if it escapes from the vein. The nurse or doctor who gives adriamycin must be carefully trained. If you notice redness or swelling at the IV site while you are receiving adriamycin, alert your health care professional immediately.
- The amount of adriamycin you will receive depends on many factors, including your height and weight, your general health or other health problems, and the type of cancer you have. Your doctor will determine your exact dosage and schedule.

Side effects – general information:

- You will not get all of the side effects mentioned below.
- Side effects are often predictable in terms of their onset, duration, and severity.
- Side effects are almost always reversible and will go away after therapy is complete.
- Side effects are quite manageable. There are many options to minimize or prevent them.

Adriamycin® - Common side effects (occurring in greater than 30% of patients):

- Early (within one week after treatment begins):
  - Pain along the site where the medication was given
  - Nausea or vomiting
- Later (within two weeks after treatment begins):
  - Low blood counts. Your white and red blood cells and platelets may temporarily decrease. This can put you at increased risk for infection, anemia and/or bleeding.
    - Onset**:** 7 days — Nadir: 10-14 days — Recovery: 21-28 days
  - Mouth sores
  - Hair loss on the scalp or elsewhere on the body (called alopecia). Most patients do lose some or all of their hair during their treatment. But your hair will grow back after treatment is completed.

Adriamycin® - Less common side effects (occurring in 10-29% of patients):

- Early (within one week after treatment begins):
  - Eyes watering
  - Urine may appear red, red-brown, orange or pink from the color of the medication for one to two days after you receive a dose.
- Later (within two weeks after treatment begins):
  - Darkening of the nail beds.
  - Darkening of the skin where previous radiation treatment has been given.
  - Problems with fertility - ability to bear children. (occurs in about 10% of both men and women - this should be discussed with your doctor prior to therapy).

***A* serious but uncommon side effect** of Adriamycin can be interference with the pumping action of the heart. You can receive only up to a certain amount of Adriamycin during your lifetime. This "lifetime maximum dose" may be lower if you have heart disease risk factors such as radiation to the chest, advancing age, and use of other heart-toxic drugs. Your doctor will check your heart function before you may take any Adriamycin and will monitor your heart closely during your treatment. Dose-related heart problems can occur as late as 7 or 8 years after treatments have ended.

Delayed effects:
There is a slight risk of developing a blood cancer such as leukemia years after taking Adriamycin. Talk to your doctor about this risk.

When to contact your doctor or health care provider:
Contact your health care provider ***immediately***, day or night, if you experience any of the following symptoms:

- Fever of 100.5º F (38º C), chills (possible signs of infection)
- Blistering at the IV site
- Shortness of breath, wheezing, difficulty breathing, closing up of the throat, swelling of facial features, hives (possible allergic reaction).

The following symptoms require medical attention, but are not emergency situations. Contact your health care provider *within 24 hours* of noticing any of the following:

- Mouth sores (painful redness, swelling or ulcers)
- Nausea (interferes with ability to eat and unrelieved with prescribed medication)
- Vomiting (vomiting more than 4-5 times in a 24 hour period)
- Diarrhea (4-6 episodes in a 24-hour period)
- Fast or irregular heart beats
- Unusual bleeding or bruising
- Black or tarry stools, or blood in your stools or urine
- Extreme fatigue (unable to carry on self-care activities)
- Swelling of the feet or ankles

Adriamycin® precautions:

- Before starting adriamycin treatment, make sure you tell your doctor about any other medications you are taking (including over-the-counter, vitamins, or herbal remedies).
- Do not receive any kind of vaccination without your doctor's approval while taking adriamycin .
- For both men and women: Use contraceptives, and do not conceive a child (get pregnant) while taking adriamycin . Barrier methods of contraception, such as condoms, are recommended. Discuss with your doctor when you may safely become pregnant after therapy.
- Do not breast feed while taking this medication.
- People with congestive heart failure, those who have already had high doses of this drug or a similar drug, and those with permanent problems with blood counts (bone marrow suppression) cannot receive this drug.

Self-care tips:

- Use of ice chips in the mouth 10-15minutes before and after IV injections of 5-FU may reduce the incidence and severity of mouth sores.
- To help treat/prevent mouth sores, use a soft toothbrush, and rinse three times a day with 1/2 to 1 teaspoon of baking soda and/or 1/2 to 1 teaspoon of salt mixed with 8 ounces of water.
- Drink at least two to three quarts of fluid every 24 hours, unless you are instructed otherwise.
- Follow regimen of anti-diarrhea medication as prescribed by your health care professional.
- Eat foods that may help reduce diarrhea (see managing side effects - diarrhea).
- You may be at risk of infection so try to avoid crowds or people with colds and/or not feeling well, and report fever or any other signs of infection immediately to your health care provider.
- Wash your hands often.
- To reduce nausea, take anti-nausea medications as prescribed by your doctor, and eat small, frequent meals.
- Avoid sun exposure. Wear SPF 15 (or higher) sunblock and protective clothing.
- Prevention of hand-foot syndrome. Modification of normal activities of daily living to reduce friction and heat exposure to hands and feet, for about a week after treatment. (For more information see - Managing side effects: hand foot syndrome).
- Keep palms of hands and soles of feet moist using emollients.
- You may experience drowsiness or dizziness; avoid driving or engaging in tasks that require alertness until your response to the drug is known.
- In general, drinking alcoholic beverages should be kept to a minimum or avoided completely. You should discuss this with your doctor.
- Get plenty of rest.
- Maintain good nutrition.

- If you experience symptoms or side effects, be sure to discuss them with your health care team. They can prescribe medications and/or offer other suggestions that are effective in managing such problems.
- Use an electric razor and a soft toothbrush to minimize bleeding.
- Avoid contact sports or activities that could cause injury.
- If you experience symptoms or side effects, be sure to discuss them with your health care team. They can prescribe medications and/or offer other suggestions that are effective in managing such problems.

Monitoring and testing:
A baseline heart evaluation is recommended before starting treatment. A full blood count will be done regularly, and a heart function test will be done as your doctor prescribes. Various tests to monitor the function of other organs (such as your kidneys and liver) will also be ordered by your physician.

How Adriamycin works:
Same as for 5-FU except:

Adriamycin is classified as an antitumor antibiotic. Antitumor antibiotics are made from natural products produced by species of the soil fungus Streptomyces. These drugs act during multiple phases of the cell cycle and are considered cell-cycle specific. There are several types of antitumor antibiotics:

- Anthracyclines: Doxorubicin, Daunomycin, Mitoxantrone, and Idarubicin
- Chromomycins: Dactinomycin and Plicamycin

CARBOPLATIN

Trade name: Paraplatin®

Drug type: Carboplatin is an anticancer drug ("antineoplastic" or "cytotoxic") chemotherapy drug. Carboplatin is classified as an "alkylating agent."

What carboplatin is used for:

- Carboplatin is used to treat ovarian cancer.
- Carboplatin is also used for other types of cancer, including lung, head and neck, endometrial, esophageal, bladder, breast, and cervical; central nervous system or germ cell tumors; osteogenic sarcoma; and as preparation for a stem cell or bone marrow transplant.

How carboplatin is given:

- Carboplatin is usually given by infusion into a vein (intravenous, IV).
- Carboplatin can also be given intra-peritoneal, directly into the peritoneal cavity in the abdomen.
- The amount of Carboplatin you receive depends on many factors, including your height and weight, your general health or other health problems, and how your body responds to it. Your doctor will determine your dose and schedule.

Side effects – General information:

- Most people do not experience all of the side effects listed.
- Side effects are often predictable in terms of their onset and duration.
- Side effects are almost always reversible and will go away after treatment is complete.
- There are many options to help minimize or prevent side effects.
- There is no relationship between the presence or severity of side effects and the effectiveness of Carboplatin.
- The side effects of Carboplatin and their severity depend on how much of Carboplatin is given. In other words, high doses may produce more severe side effects).
- Not all side effects are listed below. Some that are rare (occurring in less than 10% of patients) are not listed here.
- *You should always inform your health care provider if you experience any unusual symptoms.*

Carboplatin - Common side effects (occurring in greater than 30% of patients):

- Low blood counts (including red blood cells, white blood cells and platelets)
    - Onset**:** None reported — Nadir: 21 days — Recovery: 28 days
- Nausea and vomiting usually occurring within 24 hours of treatment
- Taste changes
- Hair loss
- Weakness
- Blood test abnormalities: Abnormal magnesium level

Carboplatin - Less common side effects (occurring in about 10-29% of patients):

- Burning sensation at the injection site
- Abdominal pain
- Diarrhea
- Constipation
- Mouth sores
- Infection
- Peripheral neuropathy: Although uncommon, a serious side effect of decreased sensation and paresthesia (numbness and tingling of the extremities) may be noted. Sensory loss, numbness and tingling, and difficulty in walking may last for at least as long as therapy is continued. These side effects may become progressively more severe with continued treatment, and your doctor may decide to decrease your dose.
- Central neurotoxicity: Infrequent but patients over age 65 are at increased risk. Symptoms include dizziness, confusion, visual changes, ringing in the ears.
- Nephrotoxicity (see kidney problems): More frequent when Carboplatin is given in high doses or to people with kidney problems.
- Hearing loss (ototoxicity) - loss of high pitched sounds.
- Abnormal blood electrolyte levels (sodium, potassium, calcium).

- Abnormal blood liver enzymes (SGOT, Alkaline phosphatase) (see liver problems).
- Cardiovascular events. Although infrequent, heart failure, blood clots and strokes have been reported with Carboplatin use. Less than 1% were life-threatening.
- Allergic reaction may occur. It would occur during the actual transfusion. This may include itching, rash, shortness of breath or dizziness (especially in patients who have received cisplatin).

When to contact your doctor or health care provider:

Contact your health care provider ***immediately***, day or night, if you experience any of the following symptoms:

- Fever of 100.5(F (38(C) or higher, or chills (possible signs of infection).
- Difficulty breathing or shortness of breath.
- Chest pain.

The following symptoms require medical attention, but are not an emergency. Contact your health care provider *within 24 hours* of noticing any of the following:

- Unusual bleeding or bruising
- Black or tarry stools, or blood in your stools or urine
- Diarrhea (4-6 episodes in a 24-hour period)
- Nausea (interferes with ability to eat and unrelieved with prescribed medications).
- Vomiting (vomiting more than 4-5 times in a 24-hour period)
- Severe abdominal pain
- Lip or mouth sores (painful redness, swelling or ulcers)
- Extreme fatigue (unable to carry on self-care activities)
- Muscle cramps or twitching
- Change in hearing
- Dizziness, confusion or visual changes

Carboplatin precautions:

- Before starting Carboplatin treatment, make sure you tell your doctor about any other medications you are taking (including prescription, over-the-counter, vitamins, herbal remedies, etc. Do not take aspirin, products containing aspirin unless your doctor specifically permits this.
- Carboplatin may be inadvisable if you have a history of severe allergic reaction to cisplatin, Carboplatin, other platinum-containing formulations or mannitol.
- Do not receive any kind of immunization or vaccination without your doctor's approval while taking Carboplatin.
- Decreased sensation, numbness and tingling in fingers and toes may become progressively worse with repeated doses of Carboplatin. It is important to report this to your doctor.
- Inform your health care professional if you are pregnant or may be pregnant prior to starting this treatment. Pregnancy category D (Carboplatin may be hazardous to the fetus. Women who are pregnant or become pregnant must be advised of the potential hazard to the fetus).

- For both men and women: Do not conceive a child (get pregnant) while taking Carboplatin. Barrier methods of contraception, such as condoms, are recommended. Discuss with your doctor when you may safely become pregnant or conceive a child after therapy.
- Do not breast feed while taking Carboplatin.

Carboplatin self-care tips:

- Use of ice chips in the mouth 10-15minutes before and after IV injections of 5-FU may reduce the incidence and severity of mouth sores.
- To help treat/prevent mouth sores, use a soft toothbrush, and rinse three times a day with 1/2 to 1 teaspoon of baking soda and/or 1/2 to 1 teaspoon of salt mixed with 8 ounces of water.
- Drink at least two to three quarts of fluid every 24 hours, unless you are instructed otherwise.
- Follow regimen of anti-diarrhea medication as prescribed by your health care professional.
- Eat foods that may help reduce diarrhea (see managing side effects - diarrhea).
- You may be at risk of infection so try to avoid crowds or people with colds and/or not feeling well, and report fever or any other signs of infection immediately to your health care provider.
- Wash your hands often.
- To reduce nausea, take anti-nausea medications as prescribed by your doctor, and eat small, frequent meals.
- Avoid sun exposure. Wear SPF 15 (or higher) sunblock and protective clothing.
- Prevention of hand-foot syndrome. Modification of normal activities of daily living to reduce friction and heat exposure to hands and feet, for about a week after treatment. (For more information see: Managing side effects: hand foot syndrome).
- Keep palms of hands and soles of feet moist using emollients.
- You may experience drowsiness or dizziness; avoid driving or engaging in tasks that require alertness until your response to the drug is known.
- In general, drinking alcoholic beverages should be kept to a minimum or avoided completely. You should discuss this with your doctor.
- Get plenty of rest.
- Maintain good nutrition.
- If you experience symptoms or side effects, be sure to discuss them with your health care team. They can prescribe medications and/or offer other suggestions that are effective in managing such problems.
- Use an electric razor and a soft toothbrush to minimize bleeding.
- Avoid contact sports or activities that could cause injury.
- If you experience symptoms or side effects, be sure to discuss them with your health care team. They can prescribe medications and/or offer other suggestions that are effective in managing such problems.

Monitoring and testing while taking carboplatin:

- You will be monitored regularly by your doctor while you are taking Carboplatin. Tests will include complete blood counts, electrolytes, kidney function tests and liver enzymes.
- Because drug toxicity is seen as numbness and tingling of fingers and toes, a periodic physical examination, which includes a check of your reflexes, is necessary to detect the need for decreased dosages.

How carboplatin works:

Carboplatin is a metal salt that acts as an alkylating agent. Alkylating agents are cell-cycle non-specific and are most effective in the resting phase of the cell.

CISPLATIN

Trade Names: Platinol®, Platinol®-AQ
Other Name: CDDP

Drug Type:

Cisplatin is an anti-cancer ("antineoplastic" or "cytotoxic") chemotherapy drug. Cisplatin is classified as an "alkylating agent."

What cisplatin is used for:

- Used to treat testicular, ovarian, bladder, head and neck, esophageal, small and non-small cell lung, breast, cervical, stomach and prostate cancers. Also to treat Hodgkin's and non-Hodgkin's lymphomas, neuroblastoma, sarcomas, multiple myeloma, melanoma, and mesothelioma.

How cisplatin is given:

- Cisplatin is administered through a vein (intravenously or IV) as an infusion.
- There is no pill form of Cisplatin.
- Cisplatin is an irritant. An irritant is a chemical that can cause inflammation of the vein through which it is given.
- If Cisplatin escapes from the vein it can cause tissue damage. The nurse or doctor who gives Cisplatin must be carefully trained. If you experience pain or notice redness or swelling at the IV site while you are receiving Cisplatin, alert your health care professional immediately.
- Before and/or after the Cisplatin infusion, extra IV fluids are given, care is taken to ensure adequate hydration before, during and after Cisplatin, to protect your kidney function.
- Cisplatin also has been used as an infusion into the abdominal cavity (contains the abdominal organs).
- The amount of Cisplatin that you receive depends on many factors, including your height and weight, your general health or other health problems, and the type of cancer that you have. Your doctor will determine your dose and schedule.

Cisplatin side effects – general information:

- Most people do not experience all of the side effects listed.
- Side effects are often predictable in terms of their onset and duration.
- Side effects are almost always reversible and will go away after treatment is complete.
- There are many options to help minimize or prevent side effects.
- There is no relationship between the presence or severity of side effects and the effectiveness of cisplatin.
- The side effects of cisplatin and their severity depend on how much of cisplatin is given. In other words, high doses may produce more severe side effects).
- Not all cisplatin side effects are listed below; some that are rare (occurring in less than 10% of patients) are not listed here.
- *You should always inform your health care provider if you experience any unusual symptoms.*

Cisplatin - Common side effects (occurring in greater than 30% of patients):

- Nausea and vomiting. Nausea may last up to 1 week after therapy. Anti-nausea medication is given before the infusion, and a prescription is also given for use after.
- Kidney toxicity. Effects on kidney function are dose related, observed 10-20 days after therapy, and are generally reversible.
- Blood test abnormalities (low magnesium, low calcium, low potassium)
- Low white blood cells (this may put you at increased risk for infection)
- Low red blood cells (anemia)
    - Onset**:** 10 days — Nadir: 14 -23 days — Recovery: 21-39 days

Cisplatin - Less common side effects (occurring in about 10-29% of patients):

- Peripheral neuropathy: Although less common, a serious side effect of decreased sensation and paresthesia (numbness and tingling of the extremities) may be noted. Sensory loss, numbness and tingling, and difficulty in walking may last for at least as long as therapy is continued. These side effects may become progressively more severe with continued treatment, and your doctor may decide to decrease your dose. Neurologic effects may be irreversible.
- High frequency hearing loss. Ringing in the ears.
- Loss of appetite
- Taste changes, metallic taste
- Increases in blood tests measuring liver function. These return to normal once treatment is discontinued. (see liver problems).
- Hair loss
- Your fertility, meaning your ability to conceive or father a child, may be affected by Cisplatin. Please discuss this issue with your health care provider.

When to contact your doctor or health care provider:

Contact your health care provider ***immediately,*** day or night, if you experience any of the following symptoms:

- Fever of 100.5ºF (38ºC) or higher or chills (possible signs of infection)

The following symptoms require medical attention, but are not an emergency. Contact your health care provider within 24 hours of noticing any of the following:

- Nausea (unable to drink fluids and unrelieved with prescription medication).
- Vomiting (more than 4-5 times in a 24 hour period).
- No urine output in a 12 hour period.
- Unusual bleeding or bruising.
- Black or tarry stools, or blood in your stools or urine.
- Extreme fatigue (unable to carry on self-care activities).
- Swelling, redness and pain in one leg or arm and not the other.
- Yellowing of the skin or eyes.

Cisplatin precautions:

- Before starting Cisplatin treatment, make sure you tell your doctor about any other medications you are taking (including prescription, over-the-counter, vitamins, herbal remedies, etc.). Do not take aspirin, products containing aspirin unless your doctor specifically permits this.
- Cisplatin may be inadvisable if you have a history of severe allergic reaction to Cisplatin, carboplatin, other platinum-containing formulations or mannitol.
- Before starting Cisplatin treatment, make sure you tell your doctor about any other medications you are taking (including prescription, over-the-counter, vitamins, herbal remedies, etc. Do not take aspirin, products containing aspirin unless your doctor specifically permits this.
- Cisplatin may be inadvisable if you have a history of severe allergic reaction to cisplatin, Cisplatin, other platinum-containing formulations or mannitol.
- Do not receive any kind of immunization or vaccination without your doctor's approval while taking Cisplatin.
- Decreased sensation, numbness and tingling in fingers and toes may become progressively worse with repeated doses of Carboplatin. It is important to report this to your doctor.
- Inform your health care professional if you are pregnant or may be pregnant prior to starting this treatment. Pregnancy category D (Cisplatin may be hazardous to the fetus. Women who are pregnant or become pregnant must be advised of the potential hazard to the fetus).
- For both men and women: Do not conceive a child (get pregnant) while taking Cisplatin. Barrier methods of contraception, such as condoms, are recommended. Discuss with your doctor when you may safely become pregnant or conceive a child after therapy.

Cisplatin self-care tips:

- Use of ice chips in the mouth 10-15minutes before and after IV injections of 5-FU may reduce the incidence and severity of mouth sores.
- To help treat/prevent mouth sores, use a soft toothbrush, and rinse three times a day with 1/2 to 1 teaspoon of baking soda and/or 1/2 to 1 teaspoon of salt mixed with 8 ounces of water.
- Drink at least two to three quarts of fluid every 24 hours, unless you are instructed otherwise.
- Follow regimen of anti-diarrhea medication as prescribed by your health care professional.
- Eat foods that may help reduce diarrhea (see managing side effects - diarrhea).
- You may be at risk of infection so try to avoid crowds or people with colds and/or not feeling well, and report fever or any other signs of infection immediately to your health care provider.
- Wash your hands often.
- To reduce nausea, take anti-nausea medications as prescribed by your doctor, and eat small, frequent meals.
- Avoid sun exposure. Wear SPF 15 (or higher) sunblock and protective clothing.
- Prevention of hand-foot syndrome. Modification of normal activities of daily living to reduce friction and heat exposure to hands and feet, for about a week after treatment. (For more information see: Managing side effects: hand foot syndrome).
- Keep palms of hands and soles of feet moist using emollients.
- You may experience drowsiness or dizziness; avoid driving or engaging in tasks that require alertness until your response to the drug is known.
- In general, drinking alcoholic beverages should be kept to a minimum or avoided completely. You should discuss this with your doctor.
- Get plenty of rest.
- Maintain good nutrition.
- If you experience symptoms or side effects, be sure to discuss them with your health care team. They can prescribe medications and/or offer other suggestions that are effective in managing such problems.
- Use an electric razor and a soft toothbrush to minimize bleeding.
- Avoid contact sports or activities that could cause injury.
- If you experience symptoms or side effects, be sure to discuss them with your health care team. They can prescribe medications and/or offer other suggestions that are effective in managing such problems.

Monitoring and testing while taking Cisplatin:

- You will be checked regularly by your doctor while you are taking Cisplatin, to monitor side effects and check your response to therapy. Periodic blood to monitor your complete blood count (CBC), your electrolytes (such as calcium, magnesium, potassium, and sodium levels) as well as the function of other organs (such as your kidneys and liver) will also be ordered by your doctor.
- Because drug toxicity is seen as numbness and tingling of fingers and toes, a periodic physical examination, which includes a check of your reflexes, is necessary to detect the need for decreased dosages.
- With high dose therapy hearing tests may be ordered as baseline and monitored at times during therapy.

CYTOXAN®

Generic Name: Cyclophosphamide
Other Trade Name: Neosar ®

Drug Type:

Cytoxan is an anti-cancer ("antineoplastic" or "cytotoxic") chemotherapy drug. Cytoxan is classified as an "alkylating agent."

What Cytoxan is used for:

- Cancers treated with Cytoxan include: Hodgkin's and non-Hodgkin's lymphoma, Burkitt's lymphoma, chronic lymphocytic leukemia (CLL), chronic myelocytic leukemia (CML), acute myelocytic leukemia (AML), acute lymphocytic leukemia (ALL), t-cell lymphoma (mycosis fungoides), multiple myeloma, neuroblastoma, retinoblastoma, rhabdomyosarcoma, Ewing's sarcoma; breast, testicular, endometrial, ovarian, and lung cancers, and in conditioning regimens for bone marrow transplantation.
- Cytoxan is also used to treat many disorders that are not cancer.

How Cytoxan is given:

- Cytoxan can be given can be given by a number of different routes. The route that it is given depends on the dosage, the condition being treated, as well as the purpose it is being used for.
- It is usually given through a vein by injection or infusion (intravenous, IV) or by mouth in tablet form, depending upon the diagnosis.
- Cytoxan is also approved to be given by a shot into a muscle (IM), into the abdominal lining (intraperitoneal, IP), or into the lining of the lung (intrapleural).
- Tablets should be given with food or after meals. Tablets should not be cut or crushed.
- The amount of Cytoxan that you will receive depends on many factors, including your height and weight, your general health or other health problems, and the type of cancer or condition you have. Your doctor will determine your exact dosage and schedule.

Cytoxan side effects – general information:

- Most people do not experience all of the side effects listed.
- Side effects are often predictable in terms of their onset and duration.
- Side effects are almost always reversible and will go away after treatment is complete.
- There are many options to help minimize or prevent side effects.
- There is no relationship between the presence or severity of side effects and the effectiveness of cisplatin.
- The side effects of Cytoxan and their severity depend on how much of cisplatin is given. In other words, high doses may produce more severe side effects).
- Not all Cytoxan side effects are listed below; some that are rare (occurring in less than 10% of patients) are not listed here.
- *You should always inform your health care provider if you experience any unusual symptoms.*

Cytoxan - Common side effects (occurring in greater than 30% of patients):

- Low blood counts. Your white and red blood cells and platelets may temporarily decrease. This can put you at increased risk for infection, anemia and/or bleeding.
- Hair loss. Temporary - usually begins 3-6 weeks after the start of therapy. Hair will grow back after treatment is completed although the color and/or texture may be different.
- Nausea and vomiting, more common with larger doses, usually beginning 6-10 hours after therapy.
- Poor appetite
- Loss of fertility. Your ability to conceive or father a child may be affected by Cytoxan. Discuss this issue with your health care provider.
- Discoloration of the skin or nails (see skin reactions).
    - Onset**:** 7 days — Nadir: 10-14 days — Recovery: 21 days

Cytoxan - Less common side effects:

- Diarrhea
- Mouth sores
- Bladder irritation and bleeding (hemorrhagic cystitis) (see bladder problems)

Delayed effects of Cytoxan:

- There is a slight risk of developing a blood cancer such as leukemia or myelodysplasia after taking Cytoxan. Talk to your doctor about this risk.

When to contact your doctor of health care provider:

Contact your health care provider ***immediately,*** day or night, if you experience any of the following symptoms:

- Fever of 100.5º F (38º C) or higher, chills (possible signs of infection)

The following symptoms require medical attention, but are not an emergency. Contact your health care provider within 24 hours of noticing any of the following:

- Nausea (interferes with ability to eat and unrelieved with prescribed medication).
- Vomiting (vomiting more than 4-5 times in a 24 hour period).
- Diarrhea (4-6 episodes in a 24-hour period).
- Unusual bleeding or bruising
- Black or tarry stools, or blood in your stools.
- Blood in the urine.
- Pain or burning with urination.
- Extreme fatigue (unable to carry on self-care activities).
- Mouth sores (painful redness, swelling or ulcers).

Cytoxan precautions:

- Before starting Cytoxan treatment, make sure you tell your doctor about any other medications you are taking (including prescription, over-the-counter, vitamins, herbal remedies, etc. Do not take aspirin, products containing aspirin unless your doctor specifically permits this.
- Do not receive any kind of immunization or vaccination without your doctor's approval while taking Cytoxan.
- For both men and women: Use contraceptives, and do not conceive a child (get pregnant) while taking Cytoxan. Barrier methods of contraception, such as condoms, are recommended.
- Do not breast feed while taking Cytoxan.

Cytoxan self-care tips:

- Drink at least two to three quarts of fluid every 24 hours, unless you are instructed otherwise.
- It is important to void (empty your bladder) frequently especially in the first 24 hours after taking Cytoxan. Report any pain or burning on urination to your health care provider.
- Use of ice chips in the mouth 10-15minutes before and after IV injections of 5-FU may reduce the incidence and severity of mouth sores.
- To help treat/prevent mouth sores, use a soft toothbrush, and rinse three times a day with 1/2 to 1 teaspoon of baking soda and/or 1/2 to 1 teaspoon of salt mixed with 8 ounces of water.
- Drink at least two to three quarts of fluid every 24 hours, unless you are instructed otherwise.
- Follow regimen of anti-diarrhea medication as prescribed by your health care professional.
- Eat foods that may help reduce diarrhea (see managing side effects - diarrhea).
- You may be at risk of infection so try to avoid crowds or people with colds and/or not feeling well, and report fever or any other signs of infection immediately to your health care provider.
- Wash your hands often.

- To reduce nausea, take anti-nausea medications as prescribed by your doctor, and eat small, frequent meals.
- Avoid sun exposure. Wear SPF 15 (or higher) sunblock and protective clothing.
- Prevention of hand-foot syndrome. Modification of normal activities of daily living to reduce friction and heat exposure to hands and feet, for about a week after treatment. (For more information see: Managing side effects: hand foot syndrome).
- Keep palms of hands and soles of feet moist using emollients.
- You may experience drowsiness or dizziness; avoid driving or engaging in tasks that require alertness until your response to the drug is known.
- In general, drinking alcoholic beverages should be kept to a minimum or avoided completely. You should discuss this with your doctor.
- Get plenty of rest.
- Maintain good nutrition.
- If you experience symptoms or side effects, be sure to discuss them with your health care team. They can prescribe medications and/or offer other suggestions that are effective in managing such problems.
- Use an electric razor and a soft toothbrush to minimize bleeding.
- Avoid contact sports or activities that could cause injury.
- If you experience symptoms or side effects, be sure to discuss them with your health care team. They can prescribe medications and/or offer other suggestions that are effective in managing such problems.

Monitoring and testing while taking Cytoxan:
You will be checked regularly by your doctor while you are taking Cytoxan, to monitor side effects and check your response to therapy. Periodic blood to monitor your complete blood count (CBC) as well as the function of other organs (such as your kidneys and liver) will also be ordered by your doctor.

How Cytoxan works:
Cyclophasphamide is classified as an alkylating agent. Alkylating agents are most active in the resting phase of the cell. These drugs are cell-cycle non-specific.

EPIRUBICIN (eh-pih-ROO-bih-cin)

Trade name: Ellence™ (Chemocare.com uses generic drug names in all descriptions of drugs. Ellence is the trade name for epirubicin. In some cases, health care professionals may use the trade name Ellence when referring to the generic drug name epirubicin.)

Drug type: Epirubicin is an anti-cancer ("antineoplastic" or "cytotoxic") chemotherapy drug. This medication is classified as an "anthracyline antitumor antibiotic

What this drug is used for:

- Epirubicin is used to treat breast cancer. It is used as adjuvant therapy in women who have had surgery and have lymph node involvement.
- May be used in place of doxorubicin in some circumstances.

How this drug is given:

- Epirubicin is given by intravenous injection (IV). The syringe needle is placed directly into the tubing of a freely flowing IV solution into a vein or central line and the drug is given over several minutes.
- Epirubicin is a vesicant. A vesicant is a chemical that causes extensive tissue damage and blistering if it escapes from the vein. The nurse or doctor who gives this drug must be carefully trained. If you notice redness or swelling at the IV site while you are receiving epirubicin, alert your health care professional immediately.
- The amount of epirubicin that you will receive depends on many factors, including your height and weight, your general health or other health problems, and the type of cancer or condition being treated. Your doctor will determine your dose and schedule.

Epirubicin - Common side effects (occurring in greater than 30% of patients):

- Early: (within one week after treatment begins)
  - Pain along the site where the medication was given
  - Nausea or vomiting
  - Urine will appear red for 1-2 days
- Later: (within two weeks after treatment begins)
  - Low blood counts. Your white and red blood cells and platelets may temporarily decrease. This can put you at increased risk for infection, anemia and/or bleeding.
  - Mouth sores
  - Hair loss on the scalp or elsewhere on the body (called alopecia). Most patients do lose some or all of their hair during their treatment. But your hair will grow back after treatment is completed.
  - Nausea and vomiting
  - Fatigue
  - Amenorrhea (loss of menstrual cycle - see menopause and chemotherapy)
    - Onset**:** None noted — Nadir: 8-14 days — Recovery: 21 days

Epirubicin - Less common side effects (occurring in about 10-29% of patients):

- Early: (within one week after treatment begins)
  - Darkening of the skin where previous radiation treatment has been given. (radiation recall - see skin reactions).
- Later: (within two weeks after treatment begins)
  - Diarrhea
  - Infection
  - Darkening of the nail beds (see skin reaction)
  - Conjunctivitis (see eye problems)
  - Problems with fertility - ability to bear children. (occurs in about 10% of both men and women - this should be discussed with your doctor prior to therapy).

- Delayed effects:
    - A serious but uncommon side effect of epirubicin can be interference with the pumping action of the heart. You can receive only up to a certain amount of epirubicin during your lifetime. This "lifetime maximum dose" may be lower if you have heart disease risk factors such as radiation to the chest, advancing age, and use of other heart-toxic drugs. Your doctor will check your heart function before you may take any epirubicin and will monitor your heart closely during your treatment. Dose-related heart problems can occur as late as 7 or 8 years after treatments have ended.
    - There is a slight risk of developing a blood cancer such as leukemia years after taking epirubicin. Talk to your doctor about this risk.

Your fertility, meaning your ability to conceive or father a child, may be affected by epirubicin. Please discuss this issue with your health care provider.

Not all side effects are listed above. Some that are rare (occurring in less than 10% of patients) are not listed here. However, you should always inform your health care provider if you experience any unusual symptoms.

When to contact your doctor or health care provider:

Contact your health care provider ***immediately***, day or night, if you experience any of the following symptoms:

- Fever of 100.5º F (38º C), chills (possible signs of infection)
- Blistering at the IV site
- Shortness of breath, wheezing, difficulty breathing, closing up of the throat, swelling of facial features, hives (possible allergic reaction).

The following symptoms require medical attention, but are not an emergency. Contact your health care provider within 24 hours of noticing any of the following:

- Nausea (interferes with ability to eat and unrelieved with prescribed medication)
- Vomiting (vomiting more than 4-5 times in a 24 hour period)
- Mouth sores (painful redness, swelling or ulcers)
- Diarrhea (4-6 episodes in a 24-hour period)
- Fast or irregular heart beats
- Unusual bleeding or bruising
- Black or tarry stools, or blood in your stools or urine
- Extreme fatigue (unable to carry on self-care activities)
- Swelling of the feet or ankles
- Redness, itchiness or pus in eyes

Precautions:

- Same as listed previously.
- People with congestive heart failure, those who have already had high doses of this drug or a similar drug, and those with permanent problems with blood counts (bone marrow suppression) cannot receive this drug.

Self-care tips:

Same as listed previously.

Monitoring and testing:

A baseline heart evaluation is recommended before starting treatment, and a heart function test may be done and may be monitored periodically while you are receiving epirubicin. You will be checked regularly by your doctor while you are taking epirubicin, to monitor side effects and check your response to therapy. Periodic blood work to monitor your complete blood count (CBC) as well as the function of other organs (such as your kidneys and liver) will also be ordered by your doctor.

How this drug works:

Epirubicin is classified as an antitumor antibiotic. Antitumor antibiotics are made from natural products produced by species of the soil fungus Streptomyces. These drugs act during multiple phases of the cell cycle and are considered cell-cycle specific. There are several types of antitumor antibiotics:

- Anthracyclines: Doxorubicin, Daunorubicin, Epirubicin, Mitoxantrone, and Idarubicin
- Chromomycins: Dactinomycin and Plicamycin
- Miscellaneous: Mitomycin and Bleomycin

GEMCITABINE

Trade Name: Gemzar ®

Drug Type:

Gemcitabine is an anti-cancer ("antineoplastic" or "cytotoxic") chemotherapy drug. Gemcitabine is classified as an antimetabolite.

What Gemcitabine is used for:

- Pancreas cancer
- Non-small cell lung cancer
- Bladder cancer
- Soft-tissue sarcoma
- Metastatic breast cancer

How Gemcitabine is given:

- Gemcitabine is given by infusion through a vein (intravenously, by IV).
- There is no pill form of Gemcitabine.
- The amount of Gemcitabine you will receive depends on many factors, including your height and weight, your general health or other health problems, and the type of cancer you have. Your doctor will determine your exact dosage and schedule.

Gemcitabine - Common side effects (occurring in more than 30% of patients):

- Flu-like symptoms (muscle pain, fever, headache, chills, fatigue)
- Fever (within 6-12 hours of first dose)
- Fatigue
- Nausea (mild)
- Vomiting
- Poor appetite
- Skin rash
- Low blood counts. Your white and red blood cells and platelets may temporarily decrease. This can put you at increased risk for infection, anemia and/or bleeding.
    - Onset**:** None noted — Nadir: 10-14 days — Recovery: 21 days
- Temporary increases in liver enzymes
- Blood or protein in the urine

Gemcitabine - Less common side effects (occurring in about 10-29% of patients):

- Diarrhea
- Weakness
- Hair loss
- Mouth sores
- Difficulty sleeping
- Shortness of breath (see lung problems)

Not all side effects are listed above, some that are rare (occurring in less than 10% of patients) are not listed here. However, you should always inform your health care provider if you experience any unusual symptoms.

When to contact your doctor or health care provider:

Contact your health care provider ***immediately,*** day or night, if you experience any of the following symptoms:

- Fever of 100.5ºF (38ºC) or higher, chills (possible signs of infection)

The following symptoms require medical attention, but are not emergency situations. Contact your health care provider within 24 hours of noticing any of the following:

- Nausea that interferes with eating and is not relieved by medications prescribed by your doctor.
- Vomiting (more than 4-5 episodes within a 24-hour period)
- Extreme fatigue (inability to perform self-care activities)
- Diarrhea (more than 4-6 episodes in a 24-hour period)
- Unusual bleeding or bruising
- Black or tarry stools, or blood in your stools or urine

Always inform your health care provider if you experience any unusual symptoms.

Gemcitabine precautions:

Same as listed previously.

Gemcitabine self-care tips:

- For flu-like symptoms, keep warm with blankets and drink plenty of liquids.
- You may experience drowsiness or dizziness; avoid driving or engaging in tasks that require alertness until your response to Gemcitabine is known.
- Same as listed previously.

Monitoring and testing while taking gemcitabine:

You will be checked regularly by your doctor while you are taking Gemcitabine, to monitor side effects and check your response to therapy. Periodic blood work will be obtained to monitor your complete blood count (CBC) as well as the function of other organs (such as your kidneys and liver) will also be ordered by your doctor.

How Gemcitabine works:

Gemcitabine belongs to the family of drugs called antimetabolites. Antimetabolites are very similar to normal substances within the cell. When the cells incorporate these substances into the cellular metabolism, they are unable to divide. Antimetabolites are cell-cycle specific. They attack cells at very specific phases in the cycle. Antimetabolites are classified according to the substances with which they interfere.

PALBOCICLIB (pal boe SYE klib)

Trade Name: Ibrance®.

Drug Type:

Palbociclib is a targeted therapy. This medication is classified as a "cyclin-dependent kinase (CDK) 4/6 inhibitor". (For more detail, see "How Palbociclib Works" below.)

What Palbociclib is used for:

- Palbociclib is used in combination with letrozole (an aromatase inhibitor) to treat postmenopausal women with estrogen receptor (ER) positive, HER2 negative advanced breast cancer.

Note: If a drug has been approved for one use, physicians may elect to use this same drug for other problems, if they believe it may be helpful.

How Palbociclib is given:

- Palbociclib is a capsule. Swallow whole with water. Take within 30 minutes of a meal. Do not break, chew, crush, dissolve or open capsules.
- Take about the same time each day.
- Do not eat grapefruit or drink grapefruit juice while on palbociclib.
- Capsules come in 3 sizes: 75 mg, 100 mg, and 125 mg.

- If you miss a dose of palbociclib, take it as soon as you remember that day. If you miss taking your dose for the entire day, go back to taking your regular dose the next day. Do not take 2 doses at the same time.
- The amount of palbociclib that you will receive depends on many factors, including your height and weight, your general health or other health problems, and the type of cancer or condition being treated. Your doctor will determine your exact dosage and schedule.

Palbociclib side effects – general information:

- Most people will not experience all of the palbociclib side effects listed.
- Palbociclib side effects are often predictable in terms of their onset, duration, and severity.
- Palbociclib side effects will improve after therapy is complete.
- Palbociclib side effects may be quite manageable. There are many options to minimize or prevent the side effects of palbociclib.
- *You should always inform your health care provider if you experience any unusual symptoms.*

Palbociclib - Common side effects (occurring in greater than 30% of patients):

- Low blood counts. Your white and red blood cells and platelets may temporarily decrease. This can put you at increased risk for infection, anemia and/or bleeding.
    - Nadir: 15 days
- Fatigue
- Upper respiratory infection

Palbociclib - Less common side effects:

- Nausea
- Mouth sores
- Hair loss/thinning
- Diarrhea
- Decreased appetite
- Vomiting
- Peripheral neuropathy (numbness/tingling of fingers/toes)
- Weakness
- Nosebleeds

A rare, but serious side effect of palbociclib is blood clots in the lung (pulmonary embolus (PE)). You should seek emergency help and notify your health care provider immediately if you develop sudden chest pain and shortness of breath. Notify your health care provider within 24 hours if you notice leg or arm swelling, redness, pain and/or skin warm to touch (signs and symptoms of possible blood clot in the arm or leg.)

Not all side effects are listed above. Side effects that are very rare -- occurring in less than about 10 percent of patients -- are not listed here. But you should always inform your health care provider if you experience any unusual symptoms.

When to contact your doctor or health care provider:

Contact your health care provider ***immediately,*** day or night, if you experience any of the following symptoms:

- Fever of 100.4º F (38º C) or higher, chills (possible signs of infection)
- Sudden chest pain and shortness of breath

The following symptoms require medical attention, but are not an emergency. Contact your health care provider within 24 hours of noticing any of the following:

- Nausea (interferes with ability to eat and unrelieved with prescribed medication)
- Vomiting (vomiting more than 4 times in a 24 hour period)
- Diarrhea (4 episodes in a 24-hour period)
- Unusual bleeding or bruising
- Black or tarry stools, or blood in your stools
- Blood in the urine
- Extreme fatigue (unable to carry on self-care activities)
- Mouth sores (painful redness, swelling or ulcers)
- Leg or arm swelling, redness, pain and/or warm to touch.

Palbociclib precautions:

- Before starting palbociclib treatment, make sure you tell your doctor about *any* other medications you are taking (including prescription, over-the-counter, vitamins, herbal remedies, etc.). Do not take aspirin, products containing aspirin unless your doctor specifically permits this.
- Do not eat grapefruit or grapefruit juice.
- Do not receive any kind of immunization or vaccination without your doctor's approval while taking palbociclib.
- Inform your health care professional if you are pregnant or may be pregnant prior to starting this treatment. This drug must not be given to a pregnant woman or a woman who intends to become pregnant.
- For both men and women: Use contraceptives, and do not conceive a child (get pregnant) while taking palbociclib. Barrier methods of contraception, such as condoms, are recommended.
- Do not breast feed while taking palbociclib.

Self-care tips:

- Drink at least two to three quarts of fluid every 24 hours, unless you are instructed otherwise.
- You may be at risk of infection so try to avoid crowds or people with colds, and report fever or any other signs of infection immediately to your health care provider.
- Wash your hands often.
- To help treat/prevent mouth sores, use a soft toothbrush, and rinse three times a day with 1 teaspoon of baking soda mixed with 8 ounces of water.

- Use an electric razor and a soft toothbrush to minimize bleeding.
- Avoid contact sports or activities that could cause injury.
- To reduce nausea, take anti-nausea medications as prescribed by your doctor, and eat small, frequent meals.
- Avoid sun exposure. Wear SPF 15 (or higher) sunblock and protective clothing.
- In general, drinking alcoholic beverages should be kept to a minimum or avoided completely. You should discuss this with your doctor.
- Get plenty of rest.
- Maintain good nutrition.
- Remain active as you are able. Gentle exercise is encouraged such as a daily walk.
- If you experience symptoms or side effects, be sure to discuss them with your health care team. They can prescribe medications and/or offer other suggestions that are effective in managing such problems.

Monitoring and testing while taking Palbociclib:

You will be checked regularly by your doctor while you are taking palbociclib, to monitor side effects and check your response to therapy. Periodic blood work will be obtained to monitor your complete blood count (CBC).

How Palbociclib works:

Targeted therapy is the result of about 100 years of research dedicated to understanding the differences between cancer cells and normal cells. To date, cancer treatment has focused primarily on killing rapidly dividing cells because one feature of cancer cells is that they divide rapidly. Unfortunately, some of our normal cells divide rapidly too, causing multiple side effects.

Targeted therapy is about identifying other features of cancer cells. Scientists look for specific differences in the cancer cells and the normal cells. This information is used to create a targeted therapy to attack the cancer cells without damaging the normal cells, thus leading to fewer side effects. Each type of targeted therapy works a little bit differently but all interfere with the ability of the cancer cell to grow, divide, repair and/or communicate with other cells.

There are different types of targeted therapies, defined in three broad categories. Some targeted therapies focus on the internal components and function of the cancer cell. The targeted therapies use small molecules that can get into the cell and disrupt the function of the cells, causing them to die. There are several types of targeted therapy that focus on the inner parts of the cells. Other targeted therapies target receptors that are on the outside of the cell. Therapies that target receptors are also known as monoclonal antibodies. Antiangiogenesis inhibitors target the blood vessels that supply oxygen to the cells, ultimately causing the cells to starve.

Researchers agree that targeted therapies are not a replacement for traditional therapies. They may best be used in combination with traditional therapies. More research is needed to identify which cancers may be best treated with targeted therapies and to identify additional targets for more types of cancer.

Palbociclib (Ibrance®) is a drug that can be used along with an aromatase inhibitor to treat women with advanced hormone receptor-positive breast cancer. Palbociclib is a reversible small molecule cyclin-dependent kinase (CDK) inhibitor. The drug blocks proteins in the cell called cyclin-dependent kinase (CDK) 4 and CDK 6. In hormone positive breast cancer cells, blocking these proteins helps stop the cells from dividing to make new cells. It helps prevent the cells from moving from G1 to S cell cycle phase in the division process. This slows cancer growth. The combination of palbociclib and aromatase inhibitor (e.g. letrozole) is more effective compared with each agent alone.

Note: We strongly encourage you to talk with your health care professional about your specific medical condition and treatments. The information contained in this website is meant to be helpful and educational, but is not a substitute for medical advice.

TAXOL®

Generic Name: Paclitaxel
Other Trade Name: Onxal ™

Drug Type:

Taxol is an anti-cancer ("antineoplastic" or "cytotoxic") chemotherapy drug. Taxol is classified as a "plant alkaloid," a "taxane" and an "antimicrotubule agent."

What Taxol is used for:

- Taxol is used for the treatment of breast, ovarian, lung, bladder, prostate, melanoma, esophageal, as well as other types of solid tumor cancers. It has also been used in Kaposi's sarcoma.

How Taxol is given:

- Taxol is given as an injection or infusion into the vein (intravenous, IV).
- Taxol is an irritant. An irritant is a chemical that can cause inflammation of the vein through which it is given. If the medication escapes from the vein it can cause tissue damage. The nurse or doctor who gives Taxol must be carefully trained. If you experience pain or notice redness or swelling at the IV site while you are receiving Taxol, alert your health care professional immediately.
- Because severe allergic reactions have occurred in some people taking Taxol, you will be asked to take medications to help prevent a reaction. Your doctor will prescribe the exact regimen.
- Taxol is given over various amounts of times and in various schedules.
- There is no pill form of Taxol.
- The amount of Taxol and the schedule that it is given will receive depend on many factors, including your height and weight, your general health or other health problems, and the type of cancer or condition being treated. Your doctor will determine your dose and schedule.

Taxol - Common side effects (occurring in greater than 30% of patients):

- Low blood counts. Your white and red blood cells and platelets may temporarily decrease. This can put you at increased risk for infection, anemia and/or bleeding.
    - Nadir: 15-21 days

- Hair loss
- Arthralgias and myalgias, pain in the joints and muscles. Usually temporary occurring 2 to 3 days after Taxol, and resolve within a few days.
- Peripheral neuropathy (numbness and tingling of the hands and feet)
- Nausea and vomiting (usually mild)
- Diarrhea
- Mouth sores
- Hypersensitivity reaction - fever, facial flushing, chills, shortness of breath, or hives after Taxol is given. The majority of these reactions occur within the first 10 minutes of an infusion. Notify your healthcare provider immediately (premedication regimen has significantly decreased the incidence of this reaction).

Taxol - Less common side effects (occurring in about 10-29% of patients):

- Swelling of the feet or ankles (edema).
- Increases in blood tests measuring liver function. These return to normal once treatment is discontinued. (See liver problems).
- Low blood pressure (occurring during the first 3 hours of infusion).
- Darkening of the skin where previous radiation treatment has been given (radiation recall - see skin reactions).
- Nail changes (discoloration of nail beds - rare) (see skin reactions).

This list includes common and less common side effects for individuals taking Taxol. Side effects that are very rare, occurring in less than 10% of patients, are not listed here. However, you should always inform your health care provider if you experience any unusual symptoms.

When to contact your doctor or health care provider:

Contact your health care provider ***immediately,*** day or night, if you experience any of the following symptoms:

- Fever of 100.5º F (38º C), chills (possible signs of infection)
- Shortness of breath, wheezing, difficulty breathing, closing up of the throat, swelling of facial features, hives (possible allergic reaction).

The following symptoms require medical attention, but are not an emergency. Contact your health care provider within 24 hours of noticing any of the following:

- If you notice any redness or pain at the site of injection
- Nausea (interferes with ability to eat and unrelieved with prescribed medication)
- Vomiting (vomiting more than 4-5 times in a 24 hour period)
- Diarrhea (4-6 episodes in a 24-hour period)
- Unusual bleeding or bruising
- Black or tarry stools, or blood in your stools or urine
- Extreme fatigue (unable to carry on self-care activities)
- Mouth sores (painful redness, swelling or ulcers)
- Yellowing of the skin or eyes

- Swelling of the feet or ankles. Sudden weight gain.
- Signs of infection such as redness or swelling, pain on swallowing, coughing up mucous, or painful urination.

Always inform your health care provider if you experience any unusual symptoms.

Taxol Precautions:

See those listed previously.

Taxol self-care tips:

- Taxol, or the medications that you take with Taxol may cause you to feel dizzy or drowsy. Do not operate any heavy machinery until you know how you respond to Taxol.
- If you notice any redness or pain at the injection site, place a warm compress, and notify your healthcare provider.
- See those listed previously.
- Taxol will make you sensitive to sunlight. You must wear sunglasses when outside, and avoid sun exposure. Wear protective clothing, and also wear SPF 15 (or higher) sun block.

Monitoring and testing while taking Taxol:

You will be checked regularly by your health care professional while you are taking Taxol, to monitor side effects and check your response to therapy. Periodic blood work to monitor your complete blood count (CBC) as well as the function of other organs (such as your kidneys and liver) will also be ordered by your doctor.

How Taxol works:

Taxol belongs to a class of chemotherapy drugs called plant alkaloids. Plant alkaloids are made from plants. The vinca alkaloids are made from the periwinkle plant (catharanthus rosea). The taxanes are made from the bark of the Pacific Yew tree (taxus). The vinca alkaloids and taxanes are also known as antimicrotubule agents. The podophyllotoxins are derived from the May Apple plant. Camptothecan analogs are derived from the Asian "Happy Tree" (Camptotheca acuminata). Podophyllotoxins and camptothecan analogs are also known as topoisomerase inhibitors. The plant alkaloids are cell-cycle specific. This means they attack the cells during various phases of division.

TAXOTERE®

Generic Name: Docetaxel

Drug Type:

Taxotere is an anti-cancer ("antineoplastic" or "cytotoxic") chemotherapy drug. Taxotere is classified as a "plant alkaloid," a "taxane" and an "antimicrotubule agent."

What Taxotere is used for:

- Approved in treatment of breast cancer, non-small cell lung cancer, advanced stomach cancer, head and neck cancer and metastatic prostate cancer.
- Also being investigated to treat small cell lung, ovarian, bladder, and pancreatic cancers, soft tissue sarcoma and melanoma.

Note: If a drug has been approved for one use, physicians may elect to use this same drug for other problems, if they believe it may be helpful.

How Taxotere is given:

- Taxotere is given through a vein (intravenously, IV)
- There is no pill form of Taxotere
- Premedication with a corticosteroid pill starting a day prior to Taxotere infusion for 3 days is given to reduce the severity of fluid retention and allergic reactions. Your doctor will prescribe the exact regimen.
- The amount of Taxotere that you will receive depends on many factors, including your height and weight, your general health or other health problems, and the type of cancer or condition being treated. Your doctor will determine your dose and schedule.

Taxotere - Common side effects (occurring in greater than 30% of patients of patients):

- Low white blood cell count (this can increase your risk for infection)
- Low red blood cell count (anemia)
    - Onset**:** 4-7 days — Nadir: 5-9 days — Recovery: 21 days
- Fluid retention with weight gain, swelling of the ankles or abdominal area.
- Peripheral neuropathy (numbness in your fingers and toes) may occur with repeated doses. This should be reported to your healthcare provider.
- Nausea
- Diarrhea
- Mouth sores
- Hair loss
- Fatigue and weakness
- Infection
- Nail changes (color changes to your fingernails or toenails may occur while taking Taxotere. In extreme, but rare, cases nails may fall off. After you have finished Taxotere treatments, your nails will generally grow back.)

Taxotere - Less common side effects (occurring in about 10-29% of patients):

- Vomiting
- Muscle/bone/joint pain (myalgias and arthralgias)
- Low platelet count (This can increase your risk of bleeding)
- Increases in blood tests measuring liver function. These return to normal once treatment is discontinued. (see liver problems)

Infusion-related Taxotere side effects (symptoms which may occur during the actual treatment):

- Allergic reactions (rash, flushing, fever, lowered blood pressure). Happens rarely, usually occurs in the first or second infusion. Frequency is reduced by premedication with corticosteroid starting one day before infusion. You will be monitored closely during the infusion for any signs of allergic reaction.
- Infusion site reactions (uncommon and generally mild, consist of darkening of the vein, inflammation, redness or dryness of the skin, or swelling of the vein).

Not all Taxotere side effects are listed previously. Some that are rare (occurring in less than 10% of patients) are not listed here. However, you should always inform your health care provider if you experience any unusual symptoms.

When to contact your doctor or health care provider:

Contact your health care provider ***immediately,*** day or night, if you experience the following symptom:

- Fever of 100.5º F (38º C) or higher, chills (possible signs of infection)

The following symptoms require medical attention, but are not an emergency. Contact your health care provider within 24 hours of noticing any of the following:

- Nausea (interferes with ability to eat and unrelieved with prescribed medication).
- Vomiting (vomiting more than 4-5 times in a 24 hour period).
- Diarrhea (4-6 episodes in a 24-hour period).
- Unusual bleeding or bruising.
- Black or tarry stools, or blood in your stools or urine.
- Extreme fatigue (unable to carry on self-care activities).
- Mouth sores (painful redness, swelling or ulcers).
- Yellowing of the skin or eyes.
- Swelling of the ankles. Weight gain. Swelling of the stomach.
- Shortness of breath.

Always inform your health care provider if you experience any unusual symptoms.

Taxotere precautions:

- For both men and women: Do not conceive a child (get pregnant) while taking Taxotere. Barrier methods of contraception, such as condoms, are recommended. Discuss with your doctor when you may safely become pregnant or conceive a child after therapy.
- See those listed previously.

Taxotere self-care tips:

- See those listed previously.

Monitoring and testing while taking Taxotere:

You will be checked regularly by your health care professional while you are taking Taxotere, to monitor side effects and check your response to therapy. Periodic blood work to monitor your complete blood count (CBC) as well as the function of other organs (such as your kidneys and liver) will also be ordered by your doctor.

How Taxotere Works:

Taxotere belongs to a class of chemotherapy drugs called plant alkaloids. Plant alkaloids are made from plants. The vinca alkaloids are made from the periwinkle plant (catharanthus rosea). The taxanes are made from the bark of the Pacific Yew tree (taxus). The vinca alkaloids and taxanes are also known as antimicrotubule agents. The podophyllotoxins are derived from the May apple plant. Camptothecan analogs are derived from the Asian "Happy Tree" (Camptotheca acuminata). Podophyllotoxins and camptothecan analogs are also known as topoisomerase inhibitors. The plant alkaloids are cell-cycle specific. This means they attack the cells during various phases of division.

- Vinca alkaloids: Vincristine, Vinblastine and Vinorelbine
- Taxanes: Paclitaxel and Taxotere
- Podophyllotoxins: Etoposide and Tenisopide
- Camptothecan analogs: Irinotecan and Topotecan

Antimicrotubule agents (such as Taxotere), inhibit the microtubule structures within the cell. Microtubules are part of the cell's apparatus for dividing and replicating itself. Inhibition of these structures ultimately results in cell death.

XELODA®

Generic Name: Capecitabine

Drug Type:

Xeloda is an anti-cancer ("antineoplastic" or "cytotoxic") chemotherapy drug. Xeloda is classified as an "antimetabolite."

What Xeloda is used for:

- Metastatic colon or rectal cancer
- Metastatic breast cancer

How Xeloda is given:

- Taken as a pill by mouth.
- Take after food (within 30 minutes of a meal) with water. (Usually taken in a divided dose 12 hours apart).
- Tablets come in 2 sizes; 150mg and 500mg.
- Do not crush, chew or dissolve tablets.
- The amount of Xeloda that you will receive depends on many factors, including your height and weight, your general health or other health problems, and the type of cancer or condition being treated. Your doctor will determine your dose and schedule.

Xeloda - Common side effects (occurring in greater than 30% of patients):

- Low red blood cell count (anemia)
    - Onset**:** N/A — Nadir: 10-14 days — Recovery: N/A
- Fatigue
- Diarrhea

- Hand -foot syndrome (Palmar-plantar erythrodysesthesia or PPE) -skin rash, swelling, redness, pain and/or peeling of the skin on the palms of hands and soles of feet. Usually mild, has started as early as 2 weeks after start of treatment. May require reductions in the dose of the medication.
- Nausea and vomiting
- Dermatitis
- Elevated liver enzymes (increased bilirubin levels) (see liver problems).

Xeloda - Less common side effects (occurring in about 10-29% of patients):

- Poor appetite
- Abdominal pain
- Low white blood cell count. (This can put you at increased risk for infection).
- Low platelet count. (This can put you at increased risk for bleeding).
- Mouth sores
- Numbness or tingling of hands or feet
- Swelling of the feet and ankles
- Fever
- Constipation
- Eye irritation (watery eyes, inflammation of the eyelids, redness).
- Shortness of breath
- Headache
- Chest, back, muscle, joint, bone pain (see pain)
- Dizziness
- Insomnia (see sleep disturbances)
- Dehydration
- Cough
- Blood clots. (Blood clots rarely can lead to pulmonary embolus or stroke - potentially life-threatening conditions).
- Excessive sleepiness, confusion, very rare seizures (see central neurotoxicity).
- Loss of balance
- Nail changes, darkening of the skin (see skin reactions)
- Taste changes

Not all Xeloda side effects are listed above. Some that are rare (occurring in less than 10% of patients) are not listed here. However, you should always inform your health care provider if you experience any unusual symptoms.

When to contact your doctor or health care provider:

Contact your health care provider immediately, day or night, if you experience the following symptom:

- Fever of 100.5º F (38º C) or higher, chills (possible signs of infection)

The following symptoms require medical attention, but are not an emergency. Contact your health care provider within 24 hours of noticing any of the following:

- Nausea (interferes with ability to eat and unrelieved with prescribed medication).
- Vomiting (vomiting more than 4-5 times in a 24 hour period)
- Diarrhea (4-6 episodes in a 24-hour period)
- Unusual bleeding or bruising
- Black or tarry stools, or blood in your stools or urine
- Constipation
- Extreme fatigue (unable to carry on self-care activities)
- Mouth sores (painful redness, swelling or ulcers)
- Swelling, redness and/or pain in one leg or arm and not the other
- Yellowing of the skin or eyes
- Tingling or burning, redness, swelling of the palms of the hands or soles of feet.
- Confusion, loss of balance, excessive sleepiness

Always inform your health care provider if you experience any unusual symptoms.

Xeloda precautions:

- Do not take aspirin, products containing aspirin unless your doctor specifically permits this.
- Avoid use of antacids within 2 hours of taking Xeloda.
- If you are on warfarin (Coumadin®) as a blood-thinner, adjustments may need to be made to your dose based on blood work.
- Xeloda may be inadvisable if you have had a hypersensitivity (allergic) reaction to fluorouracil.
- Barrier methods of contraception, such as condoms, are recommended. Discuss with your doctor when you may safely become pregnant or conceive a child after therapy.
- See those listed previously.

Xeloda self-care tips:

- Prevention of hand-foot syndrome. Modification of normal activities of daily living to reduce friction and heat exposure to hands and feet, as much as possible during treatment with Xeloda. (For more information see: Managing side effects: hand foot syndrome).
- Keep palms of hands and soles of feet moist using emollients such as Aveeno®, Udder cream, Lubriderm® or Bag Balm®.
- Follow regimen of anti-diarrhea medication as prescribed by your health care professional.
- Eat foods that may help reduce diarrhea
- Avoid sun exposure. Wear SPF 15 (or higher) sunblock and protective clothing.
- You may experience drowsiness or dizziness; avoid driving or engaging in tasks that require alertness until your response to the drug is known.
- In general, drinking alcoholic beverages should be kept to a minimum or avoided completely. You should discuss this with your doctor.
- See those listed previously.

Monitoring and testing while taking Xeloda:

You will be checked regularly by your doctor while you are taking Xeloda, to monitor side effects and check your response to therapy. Periodic blood work to monitor your complete blood count (CBC) as well as the function of other organs (such as your kidneys and liver) will also be ordered by your doctor.

How Xeloda works:

Xeloda belongs to the category of chemotherapy called antimetabolites. Antimetabolites are very similar to normal substances within the cell. When the cells incorporate these substances into the cellular metabolism, they are unable to divide. Antimetabolites are cell-cycle specific. They attack cells at very specific phases in the cycle. Antimetabolites are classified according to the substances with which they interfere.

ADDITIONAL MEDICATIONS AND TARGETED AGENTS

ARIMIDEX®

Generic Name: Anastrozole

Drug Type:

Arimidex is a hormone therapy. It fights cancer as an "aromatase inhibitor."

What Arimidex is used for:

- Arimidex is used to treat breast cancer in postmenopausal women.

How Arimidex is given:

- Arimidex is taken by mouth, in tablet form, once a day.

Side effects – general information

- Most people do not experience all of the Arimidex side effects listed.
- Arimidex side effects are often predictable in terms of their onset and duration.
- Side effects of Arimidex are almost always reversible and will go away after treatment is complete.
- There are many options to help minimize or prevent Arimidex side effects.
- There is no relationship between the presence or severity of side effects and the effectiveness of Arimidex.
- *Always inform your health care provider if you experience any unusual symptoms.*

Arimidex - Common side effects (occurring in greater than 30% of patients):

- None.

Arimidex - Less common side effects (occurring in about 10-29% of patients):

- Hot flashes (see sexuality)
- Nausea (mild)
- Decreased energy and weakness
- Bone pain
- Cough

Not all Arimidex side effects are listed above. Some that are rare (occurring in less than 10% of patients) are not listed here. However, you should always inform your health care provider if you experience any unusual symptoms.

When to contact your doctor or health care provider:

The following symptoms require medical attention, but are not emergency situations. Contact your health care provider within 24 hours of noticing any of the following:

- Nausea that interferes with eating
- Fatigue (unable to perform self-care activities)

Arimidex precautions:

- Before starting Arimidex treatment, make sure you tell your doctor about any other medications you are taking (including over-the-counter drugs, vitamins, or herbal remedies).
- Inform your health care professional if you are pregnant or may be pregnant prior to starting this treatment. Pregnancy category D (Arimidex may be hazardous to the fetus. Women who are pregnant or become pregnant must be advised of the potential hazard to the fetus).
- For both men and women: Do not conceive a child (get pregnant) while taking Arimidex. Barrier methods of contraception, such as condoms, are recommended. Discuss with your doctor when you may safely become pregnant or conceive a child after therapy.
- Do not breast feed while taking Arimidex.

Arimidex self-care tips:

- If you are experiencing hot flashes, wearing light clothing, staying in a cool environment, and putting cool cloths on your head may reduce symptoms. Consult your health care provider if these worsen, or become intolerable.
- Acetaminophen or ibuprophen may help relieve discomfort from fever, headache and/or generalized aches and pains. However, be sure to talk with your doctor before taking it.
- Arimidex causes little nausea. However, to reduce nausea, take anti-nausea medications as prescribed by your doctor, and eat small, frequent meals.
- Get plenty of rest
- Maintain good nutrition
- If you experience symptoms or side effects, be sure to discuss them with your health care team. They can prescribe medications and/or offer other suggestions that are effective in managing such problems.

Monitoring and testing while taking Arimidex:

You will be monitored regularly by your doctor while you are taking Arimidex, but no special tests are required.

How Arimidex works:

Hormones are chemical substances that are produced by glands in the body, which enter the bloodstream and cause effects in other tissues. For example, the hormone testosterone made in the testicles and is responsible for male characteristics such as deepening voice and increased body hair. The use of hormone therapy to treat cancer is based on the observation that receptors for specific hormones that are needed for cell growth are on the surface of some tumor cells. Hormone therapies work by stopping the production of a certain hormone, blocking hormone receptors, or substituting chemically similar agents for the active hormone, which cannot be used by the tumor cell. The different types of hormone therapies are categorized by their function and/or the type of hormone that is affected.

Anastozole is an aromatase inhibitor. This means it blocks the enzyme aromatase (found in the body's muscle, skin, breast and fat), which is used to convert androgens (hormones produced by the adrenal glands) into estrogen. In the absence of estrogen, tumors dependent on this hormone for growth will shrink.

AROMASIN®

Generic Name: Exemestane

Drug Type:

Aromasin is a hormone therapy. Aromasin is classified as an "aromatase inhibitor."

What Aromasin is used for:

- Aromasin is used to treat advanced breast cancer in post-menopausal women whose disease has progressed following tamoxifen therapy.
- Approved for adjuvant treatment of post-menopausal women with estrogen receptor positive early breast cancer who have received 2 to 3 years of tamoxifen therapy and are switched to Aromasin to complete a total of 5 consecutive years of adjuvant hormonal therapy.

How Aromasin is given:

- Aromasin is taken by mouth, in tablet form, once a day
- Aromasin should be taken after a meal

Side effects – general information:

- Most people do not experience all of the side effects listed.
- Side effects are often predictable in terms of their onset and duration.
- Side effects are almost always reversible and will go away after treatment is complete.
- There are many options to help minimize or prevent side effects.
- There is no relationship between the presence or severity of side effects and the effectiveness of the medication.
- *Always inform your health care provider if you experience any unusual symptoms.*

Aromasin - Common side effects (occurring in greater than 30% of patients):

- None

Aromasin - Less common side effects (occurring in about 10-29% of patients):

- Fatigue
- Nausea (mild)
- Hot flashes
- Depression
- Bone pain
- Insomnia
- Anxiety
- Shortness of breath

Not all side effects are listed above. Some that are rare (occurring in less than 10% of patients) are not listed here. However, you should always inform your health care provider if you experience any unusual symptoms.

When to contact your doctor or health care provider:

Contact your health care provider ***immediately,*** day or night, if you experience any of the following symptoms:

- Shortness of breath or difficulty breathing
- Having thoughts or feeling like you may want to harm yourself or others

The following symptoms require medical attention, but are not an emergency. Contact your health care provider within 24 hours of noticing any of the following:

- Nausea (interferes with ability to eat and unrelieved with prescribed medication)
- Extreme fatigue (unable to carry on self-care activities)
- Depressed (interfering with your ability to carry on your regular activities)

Aromasin precautions:

Same as for Arimidex, listed previously.

Aromasin self-care tips:

- Take Aromasin after a meal; at about the same time every day.
- Aromasin causes little nausea. But if you experience nausea, take anti-nausea medications as prescribed by your doctor, and eat small frequent meals. Sucking on lozenges and chewing gum may also help.
- In general, drinking alcoholic beverages should be kept to a minimum or avoided completely. You should discuss this with your doctor.
- If you are experiencing hot flashes, wearing light clothing, staying in a cool environment, and putting cool cloths on your head may reduce symptoms. Consult you health care provider if these worsen, or become intolerable.

- Acetaminophen or ibuprophen may help relieve discomfort from fever, headache and/or generalized aches and pains. However, be sure to talk with your doctor before taking it. Get plenty of rest.
- Maintain good nutrition.
- If you experience symptoms or side effects, be sure to discuss them with your health care team. They can prescribe medications and/or offer other suggestions that are effective in managing such problems.

Monitoring and testing while taking Aromasin:

You will be monitored regularly by your doctor while you are taking Aromasin, but no special tests are required.

FEMARA®

Generic Name: Letrozole

Drug Type:

Femara is a hormone therapy. Femara is classified as an aromatase inhibitor.

What Femara is used for:

- Femara is used to treat estrogen receptor positive or hormone receptor unknown locally advanced or metastatic (spread) breast cancer. It is indicated only for women who are post-menopausal (menstrual periods have stopped). It may be used as first-line therapy.
- Femara may be used to treat advanced breast cancer in post-menopausal women whose disease has gotten worse after anti-estrogen therapy.
- Femara has been approved for adjuvant treatment of postmenopausal women with hormone receptor positive early breast cancer.

How Femara is given:

- Femara is a pill, taken by mouth.
- You should take Femara at about the same time each day. You may take Femara with or without food. If you miss a dose, do not take a double dose the next day.
- You should not stop taking Femara without discussing with your physician.
- The amount of Femara that you will receive depends on many factors, including your general health or other health problems, and the type of cancer or condition being treated. Your doctor will determine your dose and how long you will be taking Femara.

Femara - Common side effects (occurring in greater than 30% of patients):

- None.

Femara - Less common side effects (occurring in about 10-29% of patients):

- Hot flashes
- Bone pain
- Back pain

- Joint pain
- Nausea
- Fatigue
- Shortness of breath
- Coughing

Not all Femara side effects are listed above. Some that are rare (occurring in less than 10% of patients) are not listed here. However, you should always inform your health care provider if you experience any unusual symptoms.

When to contact your doctor or health care provider:

The following symptoms require medical attention, but are not an emergency. Contact your health care provider within 24 hours of noticing any of the following:

- Nausea (interferes with ability to eat and unrelieved with prescribed medication)
- Extreme fatigue (unable to carry on self-care activities)
- Pain that is unrelieved with prescribed medication

Always inform your health care provider if you experience any unusual symptoms.

Femara precautions:

Same as for Arimidex/Aromasin, listed previously.

Monitoring and testing while taking Femara:

You will be monitored regularly by your doctor while you are taking Femara, but no special tests are required.

How Femara works:

Femara is an aromatase inhibitor. This means it blocks the enzyme aromatase (found in the body's muscle, skin, breast and fat), which is used to convert androgens (hormones produced by the adrenal glands) into estrogen. In the absence of estrogen, tumors dependent on this hormone for growth will shrink.

HERCEPTIN®

Generic name: Trastuzumab

Drug type: Herceptin is a monoclonal antibody

What this drug is used for:

- Trastuzumab is used to treat metastatic (spread) breast cancer. It is effective against tumors that overexpress the HER2/neu protein.
- As part of chemotherapy regimen for adjuvant treatment of lymph-node positive, HER2/neu protein positive breast cancer.
- It is not known whether or not trastuzumab may be effective in other cancers that may also have this HER-2/neu protein, including ovarian, stomach, colon, endometrial, lung, bladder, prostate, and salivary gland tumors.

Note: If a drug has been approved for one use, physicians may elect to use this same drug for other problems, if they believe it may be helpful.

How this drug is given:

- Trastuzumab is given through an infusion into vein (intravenous, IV). The first dose is given over 90 minutes. If well-tolerated subsequent maintenance doses may be given over 30 minutes.
- The amount of trastuzumab that you will receive depends on many factors, including your height and weight, your general health or other health problems, and the type of cancer or condition being treated. Your doctor will determine your dose and schedule.

Side effects – General information

- Not all side effects are listed above. Some that are rare (occurring in less than 10% of patients) are not listed here. However, you should always inform your health care provider if you experience any unusual symptoms.

Herceptin - Common side effects (occurring in greater than 30% of patients taking single-agent trastuzumab):

- During the first infusion of this trastuzumab, you may develop chills or a fever. Your health care provider might prescribe medicine to prevent or treat these symptoms.
- Weakness
- Nausea

Herceptin - Less common side effects (occurring in about 10-29% of patients) based on the single agent trastuzumab):

- Headache
- Diarrhea
- Abdominal pain
- Back pain
- Infection
- Flu-like symptoms
- Vomiting
- Cough
- Shortness of breath
- Rhinitis or pharyngitis (see cold symptoms)
- Insomnia (see sleep problems)
- Rash (see skin reactions)
- Dizziness
- Swelling (usually of the feet, ankles or hands)

Herceptin - Uncommon but serious side effects

- Serious hypersensitivity reactions (anaphylaxis) (see allergic reactions), have been associated with trastuzumab. Most of these events occur within 24 hours of infusion. However, delayed reactions have occurred. Trastuzumab should be used with caution in people with lung problems. If a person experiences severe hypersensitivity reaction, trastuzumab may be discontinued.
- Interference with the pumping action of the heart. The incidence of heart problems (heart failure) increase in people with heart disease or other risk factors such as radiation to the chest, advancing age, and use of other heart-toxic drugs (such as doxorubicin and cyclophosphamide). Your doctor may check your heart function before you may take any trastuzumab and will monitor your heart closely during your treatment. Trastuzumab may be discontinued if symptoms of heart failure appear.

When to contact your doctor or health care provider:

Contact your health care provider ***immediately*****,** day or night, if you experience any of the following symptoms:

- Shortness of breath or difficulty breathing, closing of the throat, swelling of facial features, hives (possible allergic reaction)

The following symptoms require medical attention, but are not an emergency. Contact your health care provider *within 24 hours* of noticing any of the following:

- Nausea (interferes with ability to eat and unrelieved with prescribed medication)
- Vomiting (vomiting more than 4-5 times in a 24 hour period)
- Diarrhea (4-6 episodes in a 24-hour period)
- Swelling of the feet or ankles. Sudden weight gain
- Signs of infection such as redness or swelling, pain on swallowing, coughing up mucous, or painful urination.
- Pain that is unrelieved by prescribed medication

Always inform your health care provider if you experience any unusual symptoms.

Precautions:

Same as listed previously.

Self-care tips:

- Drink at least two to three quarts of fluid every 24 hours, unless you are instructed otherwise.
- This medication causes little nausea. But if you experience nausea, take anti-nausea medications as prescribed by your doctor, and eat small frequent meals. Sucking on lozenges and chewing gum may also help.
- You may experience drowsiness or dizziness; avoid driving or engaging in tasks that require alertness until your response to the drug is known.
- For flu-like symptoms, keep warm with blankets and drink plenty of liquids. There are medications that can help reduce the discomfort caused by chills.
- Same as listed previously.

Monitoring and testing:

You will be checked regularly by your health care professional while you are taking trastuzumab, to monitor side effects and check your response to therapy. Periodic blood work to monitor your complete blood count (CBC) as well as the function of other organs (such as your kidneys and liver) may also be ordered by your doctor. Your doctor will monitor your heart while you are taking trastuzumab.

How this drug works:

Monoclonal antibodies are a relatively new type of "targeted" cancer therapy. Antibodies are part of the immune system. Normally, the body creates antibodies in response to an antigen (such as a protein in a germ) entering the body. The antibodies attach to the antigen in order to mark it for destruction by the body's immune system. In the laboratory, scientists analyze specific antigens on the surface of cancer cells (target) to determine a protein to match the antigen. Then, using animal and human proteins, scientists work to create a special antibody that will attach to the target antigen. Antibodies will attach to matching antigens like a key fits a lock. This technology allows treatment to target specific cells, causing less toxicity to healthy cells. Monoclonal antibody therapy can be done only for cancers in which antigens (and the respective antibodies) have been identified.

Trastuzumab works by targeting the HER2/neu receptor on cancer cells. The HER2 gene produces a protein receptor on the cell surface that signals normal cell growth by telling the cell to divide and multiply. Some cancerous breast tissue has too much HER2 (HER2/neu overexpression), triggering the cells to divide and multiply very rapidly. Trastuzumab attaches to the HER2 receptors to prevent cells from multiplying, preventing further cancer growth and slowing cancer progression. It may also work by stimulating an immune mechanism.

NEULASTA™

Generic name: Pegfilgrastim
Other names: G-CSF, Granlocyte - Colony stimulating factor

Drug type:

Neulasta is a biologic response modifier. It is classified as a colony stimulating factor.

What is this drug used for?

- This medicine is used to stimulate the growth of "healthy" white blood cells in the bone marrow, once chemotherapy is given. White blood cells help the body to fight infection. *This is not a chemotherapy drug.*
- This medication is usually given at least 24 hours after chemotherapy to stimulate the growth of new, healthy, white blood cells (WBC).
- Pegfilgrastim is a longer acting form of filgrastim and the manufacturer recommends that it should not be given within 14 days prior to chemotherapy.
- Pegfilgrastim is given as a single injection.

How this drug is given:

- This medicine can be given as a shot underneath the skin (subcutaneous [SQ]), in pre-filled syringes. The dose of pegfilgrastim depends upon why you are receiving this drug.
- The amount of this medication you will receive also depends on many other factors, including your height and weight, your general health or other health problems, and the type of cancer you have. Your doctor will determine your dose and schedule.

Side effects – general information:

- Pegfilgrastim is a support medication. The following list includes side effects attributed to pegfilgrastim. Other side effects experienced were attributed to the chemotherapy and/or the disease.
- *Always inform your health care provider if you experience any unusual symptoms.*

Pegfilgrastim - Common side effects (occurring in greater than 30% of patients):

- None

Pegfilgrastim - Less common side effects (occurring in about 10-29% of patients):

- Pain (bone pain)
- Blood test abnormalities (temporary elevation in lactate dehydrogenase)
- These will return to normal once treatment is discontinued
- Tenderness at the site of injection

When to contact your doctor:

Contact your health care provider ***immediately***, day or night, if you experience any of the following symptoms:

- Fever of 100.5º F (38º C), chills, sore throat (possible signs of infection)
- Shortness of breath
- Rapid heart beat
- Bleeding that does not stop after a few minutes
- Any new rashes on your skin

The following symptoms require medical attention, but are not emergency situations. Contact your health care provider within 24 hours *of* noticing any of the following:

- Bone pain that does not go away despite taking recommended pain reliever.

Pegfilgrastim precautions:

- Before starting pegfilgrastim treatment, make sure you tell your doctor about any other medications you are taking (including prescription, over-the-counter, vitamins, herbal remedies, etc.). Do not take aspirin, products containing aspirin unless your doctor specifically permits this.
- The manufacturer recommends that the first dose of pegfilgrastim be given no sooner than 24 hours after chemotherapy. Your doctor will discontinue therapy with pegfilgrastim when your white blood cell count has reached acceptable levels.

- Pegfilgrastim may be inadvisable if you have had a hypersensitivity (allergic) reaction to filgrastim, pegfilgrastim or E. coli-derived proteins.
- Do not receive any kind of immunization or vaccination without your doctor's approval while taking pegfilgrastim.
- Inform your health care professional if you are pregnant or may be pregnant prior to starting this treatment. Pregnancy category C (use in pregnancy only when benefit to the mother outweighs risk to the fetus).
- For both men and women: Do not conceive a child (get pregnant) while taking pegfilgrastim. Barrier methods of contraception, such as condoms, are recommended. Discuss with your doctor when you may safely become pregnant or conceive a child after therapy.
- Do not breast feed while taking this medication.
- Pegfilgrastim should be used with caution in people taking lithium.

Self-care tips:

- If you are performing your own subcutaneous self-injections, remove the syringe from the refrigerator 30 minutes prior to injection. This will reduce local stinging at the injection site.
- You may experience bone or joint pain as a result of this medication. Ask your healthcare provider if you may take a mild pain medicine to relieve this. Acetominophen (Tylenol®) may help.
- Apply a warm compress if you have any pain, redness or swelling at the injection site, and notify your doctor.
- You may be at risk of infection so try to avoid crowds or people with colds, and report fever or any other signs of infection immediately to your health care provider.
- Same as listed previously.

Monitoring and testing:

You will be checked regularly by your doctor while you are taking pegfilgrastim to monitor side effects and check your response to therapy. Periodic blood work to monitor your complete blood count (CBC) as well as the function of other organs (such as your kidneys and liver) will also be ordered by your doctor.

How this drug works:

Colony-Stimulating Factors: In the body's bone marrow (the soft, sponge-like material found inside bones) blood cells are produced. There are three major types of blood cells; white blood cells, which fight infection; red blood cells, which carry oxygen to and remove waste products from organs and tissues; and platelets, which enable the blood to clot. Cancer treatments such as chemotherapy and radiation therapy can affect these cells which put a person at risk for developing infections, anemia and bleeding problems. Colony-stimulating factors are substances that stimulate the production of blood cells and promote their ability to function. They do not directly affect tumors but through their role in stimulating blood cells they can be helpful as support of the person’s immune system during cancer treatment.

Pegfilgrastim is a growth factor that stimulates the production, maturation and activation of neutrophils. Pegfilgrastim also stimulates the release of neutrophils (a type of white blood cell) from the bone marrow. In patients receiving chemotherapy, pegfilgrastim can accelerate the recovery of neutrophils, reducing the neutropenic phase (the time in which people are susceptible to infections). Pegfilgrastim is a long-acting version of filgrastim.

Pegfilgrastim is filgrastim with a substance called polyethylene glycol (PEG) attached to it. The attachment process is called pegylation, and is used to allow active substances (the filgrastim) to stay in the body longer before they are broken down and eliminated.

PERJETA™

Generic Name: Pertuzumab
Trade Name: Perjeta™

Drug Type:

Perjeta™ is an anti-cancer ("antineoplastic" or "cytotoxic") chemotherapy drug. This medication is classified as an "antineoplastic agent and a monoclonal antibody". (For more detail, see “How Perjeta™ Works” below).

What Perjeta™ is used for:

- Indicated in combination with trastuzumab and docetaxel for the treatment of patients with HER2-positive breast cancer. HER2 expression must be present for initiation of Perjeta™ using FDA-approved test.

Note: If a drug has been approved for one use, physicians may elect to use this same drug for other problems, if they believe it may be helpful.

How Perjeta™ is given:

- As an infusion into a vein (intravenous, IV) over 60 minutes.

Side effects – general information:

- Most people will not experience all of the Perjeta™ side effects listed.
- Perjeta™ side effects are often predictable in terms of their onset, duration, and severity.
- Perjeta™ side effects will improve after therapy is complete.
- Perjeta™ side effects may be quite manageable. There are many options to minimize or prevent the side effects of Perjeta™.
- Not all side effects are listed below. Side effects that are very rare -- occurring in less than about 10 percent of patients -- are not all listed here. But you should always inform your health care provider if you experience any unusual symptoms.
- *Always inform your health care provider if you experience any unusual symptoms.*

Perjeta™ - Common side effects (occurring in greater than 30% of patients - Reactions reported in combination therapy with trastuzumab and docetaxe)**:**

- Diarrhea
- Hair loss
- Low white blood cell count
- Nausea
- Fatigue
- Rash
- Peripheral neuropathy (numbness & tingling in hands and feet)

Perjeta™ - Less common side effects (occurring in about 10-29% of patients) in combination therapy with trastuzumab and docetaxe)*:*

- Decreased appetite
- Mouth irritation or mouth sores
- Weakness
- Anemia
- Swelling
- Muscle aches
- Nail changes
- Joint aches
- Shortness of breath
- Headache
- Fever
- Abnormal taste
- Upper respiratory tract infection
- Vomiting
- Itching
- Watery eyes
- Difficulty sleeping
- Dizziness
- Abdominal pain
- Dry skin
- Allergic reactions/hypersensitivity reactions

When to Contact Your Doctor or Health Care Provider:

Contact your health care provider ***immediately***, day or night or go to the emergency room, if you experience any of the following symptoms:

- Fever of 100.4º F (38º C) or higher, chills (possible signs of infection)
- Signs of a reaction (wheezing; chest tightness; fever; itching; bad cough; blue or grey skin color; seizures; swelling of the face, lips tongue or throat)
- Trouble breathing
- Chest pain or pressure or a fast heartbeat

The following symptoms require medical attention, but are not an emergency. Contact your health care provider within 24 hours of noticing any of the following:

- Signs of infection: Fever, chills, very bad sore throat, ear or sinus pain, cough with or without sputum, pain with passing urine, wounds that will not heal
- Nausea (interferes with ability to eat and unrelieved with prescribed medication)
- Vomiting (vomiting more than 4-5 times in a 24 hour period)
- Diarrhea (4-6 episodes in a 24-hour period)
- Dizziness or lightheadedness
- Bad headache
- Big weight gain
- Unusual bleeding or bruising
- Extreme fatigue (unable to carry on self-care activities)
- Muscle weakness
- Mouth sores (painful redness, swelling or ulcers)

Precautions:

- Before starting Perjeta™ treatment, make sure you tell your doctor about *any* other medications you are taking (including prescription, over-the-counter, vitamins, herbal remedies, etc.).
- Do not receive any kind of immunization or vaccination without your doctor's approval while taking Perjeta™.
- Inform your health care professional if you are pregnant or may be pregnant prior to starting this treatment. Pregnancy category D (Perjeta™ may be hazardous to the fetus. Women who are pregnant or become pregnant must be advised of the potential hazard to the fetus.)
- For both men and women: Use contraceptives, and do not conceive a child (get pregnant) while taking Perjeta™. Barrier methods of contraception, such as condoms, are recommended. Verify pregnancy status prior to treatment initiation. Effective contraception should be used during therapy and for 6 months after treatment.
- Do not breast feed while taking Perjeta™.

Self-care tips:

- Drink at least two to three quarts of fluid every 24 hours, unless you are instructed otherwise.
- You may be at risk of infection so try to avoid crowds or people with colds, and report fever or any other signs of infection immediately to your health care provider.
- Wash your hands often.
- To help treat/prevent mouth sores, use a soft toothbrush, and rinse three times a day with 1 teaspoon of baking soda mixed with 8 ounces of water.
- Use an electric razor and a soft toothbrush to minimize bleeding.
- Avoid contact sports or activities that could cause injury.
- To reduce nausea, take anti-nausea medications as prescribed by your doctor, and eat small, frequent meals.
- Follow regimen of anti-diarrhea medication as prescribed by your health care professional.
- Eat foods that may help reduce diarrhea (see managing side effects - diarrhea).
- Acetaminophen or ibuprophen may help relieve discomfort from fever, headache and/or generalized aches and pains. However, be sure to talk with your doctor before taking it.
- Avoid sun exposure. Wear SPF 15 (or higher) sun block and protective clothing.
- In general, drinking alcoholic beverages should be kept to a minimum or avoided completely. You should discuss this with your doctor.
- Get plenty of rest.
- Maintain good nutrition.
- Remain active as you are able. Gentle exercise is encouraged such as a daily walk.
- If you experience symptoms or side effects, be sure to discuss them with your health care team. They can prescribe medications and/or offer other suggestions that are effective in managing such problems.

Monitoring and testing while taking Perjeta™:

- Lab work to check blood counts and liver/kidney functions will be checked regularly by your health care professional while you are taking Perjeta™, to monitor side effects and check your response to therapy.
- HER2 expression must be present for initiation of Perjeta™ (either as 3+ IHC [Dako Herceptest™] or FISH amplification ratio >2 [Dako *HER2* FISH pharmDx™ test]).
- Negative pregnancy test prior to initiation.
- Cardiac studies to assess Left Ventricular Ejection Fracture (LVEF), may be ordered.

How Perjeta™ works:

Targeted therapy is the result of about 100 years of research dedicated to understanding the differences between cancer cells and normal cells. To date, cancer treatment has focused primarily on killing rapidly dividing cells because one feature of cancer cells is that they divide rapidly. Unfortunately, some of our normal cells divide rapidly too, causing multiple side effects.

Targeted therapy is about identifying other features of cancer cells. Scientists look for specific differences in the cancer cells and the normal cells. This information is used to create a targeted therapy to attack the cancer cells without damaging the normal cells, thus leading to fewer side effects. Each type of targeted therapy works a little bit differently but all interfere with the ability of the cancer cell to grow, divide, repair and/or communicate with other cells.

There are different types of targeted therapies, defined in three broad categories. Some targeted therapies focus on the internal components and function of the cancer cell. The targeted therapies use small molecules that can get into the cell and disrupt the function of the cells, causing them to die. There are several types of targeted therapy that focus on the inner parts of the cells. Other targeted therapies target receptors that are on the outside of the cell. Therapies that target receptors are also known as monoclonal antibodies. Antiangiogenesis inhibitors target the blood vessels that supply oxygen to the cells, ultimately causing the cells to starve.

Perjeta™ has the component of an antibody type of targeted therapy. Antibodies are an integral part of the body's immune system. Normally the body creates antibodies in response to an antigen (such as a protein or a germ) that has entered the body. The antibodies attach to the antigen in order to mark it for destruction by the immune system. To make anti-cancer antibodies in the laboratory, scientists analyze specific antigens on the surface of cancer cells (the targets). Then using animal and human proteins, they create a specific antibody that will attach to the target antigen on the cancer cells. When given to a patient, these antibodies will attach to matching antigens like a key fits a lock. Since antibodies target only specific cells, they may cause less toxicity to healthy cells. Monoclonal antibody therapy is usually only given for cancers in which antigens and the respective antibodies have been identified already.

Perjeta™ is a monoclonal antibody which targets the surface of the cells human epidermal growth factor receptor 2 protein (HER2) on the cancer cell, interfering with HER2 causing cancer cell death. Perjeta™ binds to a different area of the HER2 protein than trastuzumab so that when pertuzumab is combined with trastuzumab, a more complete blockage of HER2 signaling occurs.

Research continues to identify which cancers may be best treated with targeted therapies and to identify additional targets for more types of cancer.

Note: We strongly encourage you to talk with your health care professional about your specific medical condition and treatments. The information contained in this website is meant to be helpful and educational, but is not a substitute for medical advice.

TAMOXIFEN (ta MOKS i fen)

Trade names: Novaldex®

Drug type: Tamoxifen is a hormone therapy. This medication is classified as an "anti-estrogen."

What this drug is used for:

- Tamoxifen may be given as adjuvant therapy (treatment after successful surgery) in women or men with lymph node negative or lymph node positive breast cancer. Cancers with positive estrogen and progesterone receptors are more likely to benefit from tamoxifen. Tamoxifen reduces the risk of getting breast cancer in the opposite breast.
- Tamoxifen may be prescribed in metastatic (cancer that has spread) breast cancer in both women and men.

- Tamoxifen may be prescribed in women with ductal carcinoma in situ (DCIS) who have completed surgery and radiation therapy. Tamoxifen may reduce the risk of invasive breast cancer. Risks and benefits of tamoxifen therapy should be discussed in this setting.
- Tamoxifen may be prescribed for women at high risk of breast cancer to reduce the incidence of developing breast cancer. Risks and benefits of tamoxifen therapy should be discussed in this setting.
- Tamoxifen may also be prescribed for treatment of ovarian cancer.

How this drug is given:

- Tamoxifen is a pill, given by mouth. The pill should be swallowed whole.
- Tamoxifen should be taken at about the same time each day with a full glass of water. If you miss a dose, do not take a double dose the next day.
- The amount of tamoxifen that you will receive depends on many factors, including your general health or other health problems, and the type of cancer or condition being treated. Your doctor will determine your dose, schedule and duration of treatment.

Side effects – General information

- Not all side effects are listed above. Some that are rare (occurring in less than 10% of patients) are not listed here. However, you should always inform your health care provider if you experience any unusual symptoms.
- *Always inform your health care provider if you experience any unusual symptoms.*

Tamoxifen - Common side effects (occurring in greater than 30% of patients):

- Hot flashes
- Vaginal discharge
- Swelling (fluid retention in feet, ankles, or hands)
- Loss of libido (particularly in men)

Tamoxifen - Less common side effects (occurring in about 10-29% of patients):

- Nausea
- Menstrual irregularities
- Vaginal bleeding
- Weight loss
- Mood changes (see anxiety and/or depression)

Tamoxifen - Rare, but serious side effect

- Blood clots, including deep vein thrombosis (DVT) and pulmonary embolus. You should seek emergency help and notify your health care provider immediately if you develop sudden chest pain and shortness of breath. Notify your health care provider within 24 hours if you notice that one leg is swollen, red, painful and/or warm to touch and the other is not.
- The development of uterine cancer. Women who have not had a hysterectomy should have regular pap smears and gyn examinations. Abnormal vaginal bleeding should be reported to your health care provider.

Your fertility, meaning your ability to conceive or father a child, may be affected by tamoxifen. Please discuss this issue with your health care provider.

When to contact your doctor or health care provider:

Seek emergency help ***immediately*** and notify your health care provider, if you experience the following symptom:

- Sudden shortness of breath and/or chest pain

The following symptoms require medical attention, but are not an emergency. Contact your health care provider within 24 hours of noticing any of the following:

- Swelling, redness and/or pain in one leg or arm and not the other
- New breast lumps
- Excessive vaginal discharge or bleeding, menstrual (period) pain or irregularities
- Nausea (interferes with ability to eat and unrelieved with prescribed medication)
- Depression (interfering with your ability to carry on your regular activities)
- Changes in vision

Precautions:

- Before starting tamoxifen treatment, make sure you tell your doctor about any other medications you are taking (including prescription, over-the-counter, vitamins, herbal remedies, etc.). Do not take aspirin, or products containing aspirin unless your doctor specifically permits this.
- Let your health care professional know if you have ever had a blood clot that required medical treatment.
- Inform your health care professional if you are pregnant or may be pregnant prior to starting this treatment. Pregnancy category D (tamoxifen may be hazardous to the fetus. Women who are pregnant or become pregnant must be advised of the potential hazard to the fetus).
- For both men and women: Do not conceive a child (get pregnant) while taking tamoxifen. Barrier methods of contraception, such as condoms, are recommended. Discuss with your doctor when you may safely become pregnant or conceive a child after therapy.
- Do not breast feed while taking this medication.

Self-care tips:

- Do not stop taking this medication unless your healthcare provider tells you. You may be on it for as long as 5 years.
- If you are experiencing hot flashes, wearing light clothing, staying in a cool environment, and putting cool cloths on your head may reduce symptoms. Consult you health care provider if these worsen, or become intolerable
- This medication causes little nausea. But if you experience nausea, take anti-nausea medications as prescribed by your doctor, and eat small frequent meals. Sucking on lozenges and chewing gum may also help.
- Avoid sun exposure. Wear SPF 15 (or higher) sunblock and protective clothing.

Monitoring and testing:

You will be checked regularly by your health care professional while you are taking tamoxifen, to monitor side effects and check your response to therapy. Periodic blood work to monitor your complete blood count (CBC) as well as the function of other organs (such as your kidneys and liver) may also be ordered by your doctor.

Women will need a gynecologic (GYN) examination before therapy, and during therapy, at regular intervals. Discuss the appropriate schedule with your health care provider.

How this drug works:

Hormones are chemical substances that are produced by glands in the body, which enter the bloodstream and cause effects in other tissues. For example, the hormone testosterone, made in the testicles and is responsible for male characteristics such as deepening voice and increased body hair. The use of hormone therapy to treat cancer is based on the observation that receptors for specific hormones that are needed for cell growth are on the surface of some tumor cells. Hormone therapy can work by stopping the production of a certain hormone, blocking hormone receptors, or substituting chemically similar agents for the active hormone, which cannot be used by the tumor cell. The different types of hormone therapies are categorized by their function and/or the type of hormone that is affected.

Tamoxifen is an antiestrogen. Antiestrogens bind to estrogen receptor site on cancer cells thus blocking estrogen from going into the cancer cell. This interferes with cell growth and eventually leads to cell death.

TYKERB® (TIE-curb)

Generic name: lapatinib

Drug type:

TYKERB is a targeted therapy. TYKERB is classified as a signal transduction inhibitor - tyrosine kinase inhibitor, inhibitor of EGFR and HER2.

What TYKERB is used for:

- Treatment of patients with advanced or metastatic breast cancer that is HER-2 positive.

How TYKERB is given:

- TYKERB is a tablet to be taken by mouth.
- Tablets come in 1 dosage size, 250mg.
- Take TYKERB exactly as instructed by your doctor.
- TYKERB should be taken at least on hour before, or at least one hour after food (take total dose at the same time daily, dividing doses is not recommended).
- Do not eat or drink grapefruit products while taking lapatinib.
- If you miss a dose of TYKERB, take it as soon as you remember that day. If you miss a day, do not double your dose the next day. Just skip the missed dose. Call your healthcare provider if you are not sure what to do.
- Your doctor may adjust your dose of lapatinib depending on how you tolerate the treatment.
- Store TYKERB tablets at room temperature between 59o and 86o (15o to 30oC). Keep the container closed tightly, and out of the reach of children.

TYKERB - Common side effects (occurring in greater than 30% of patients) when taken in combination with capecitabine:

- Diarrhea
- Hand-foot syndrome (Palmar-plantar erythrodysesthesia or PPE) -skin rash, swelling, redness, pain and/or peeling of the skin on the palms of hands and soles of feet. Usually mild, has started as early as 2 weeks after start of treatment. May require reductions in the dose of the medication.
- Low red blood cell count (anemia)
- Nausea and vomiting.
- Elevated liver enzymes (increased AST, ALT, and bilirubin levels).

TYKERB - Less common side effects when receiving in combination with capecitabine:

- Rash
- Low blood counts. Your white blood cells and platelets may temporarily decrease. This can put you at increased risk for infection, and/or bleeding.
- Fatigue, tiredness
- Abdominal pain
- Mouth sores
- Heartburn
- Pain in arms, legs, back
- Shortness of breath
- Difficulty sleeping
- Dry skin

TYKERB - Rare side effects

- Heart problems including decreased pumping of blood from the heart, or abnormal heartbeat can occur rarely.
- Severe diarrhea, which may lead to dehydration.

When to contact your doctor or health care provider:

Contact your health care provider ***immediately,*** day or night, if you experience any of the following symptoms:

- Fever of 100.5º F (38º C) or higher, chills (possible signs of infection)
- Palpitations or are short of breath.

The following symptoms require medical attention, but are not an emergency. Contact your health care provider within 24 hours of noticing any of the following:

- Diarrhea (4-6 episodes in a 24-hour period).
- Nausea (interferes with ability to eat and unrelieved with prescribed medication).
- Vomiting (vomiting more than 4-5 times in a 24 hour period).
- Tingling or burning, redness, swelling of the palms of the hands or soles of feet.

- Unusual bleeding or bruising
- Black or tarry stools, or blood in your stools.
- Blood in the urine.
- Extreme fatigue (unable to carry on self-care activities).
- Mouth sores (painful redness, swelling or ulcers).
- Unable to eat or drink for 24 hours or have signs of dehydration: tiredness, thirst, dry mouth, dark and decrease amount of urine, or dizziness.

TYKERB precautions:

- Do not take aspirin, products containing aspirin unless your doctor specifically permits this.
- TYKERB interacts with many common medications. Be sure to notify your doctor before starting any new medications.
- Barrier methods of contraception, such as condoms, are recommended.
- See those listed previously.

Self-care tips:

- Drink at least two to three quarts of fluid every 24 hours, unless you are instructed otherwise.
- Follow regimen of anti-diarrhea medication as prescribed by your health care professional.
- Eat foods that may help reduce diarrhea.
- Prevention of hand-foot syndrome. Modification of normal activities of daily living to reduce friction and heat exposure to hands and feet, as much as possible during treatment with lapatinib.
- Keep palms of hands and soles of feet moist using emollients such as Aveeno®, Udder cream, Lubriderm® or Bag Balm®.
- To reduce nausea, take anti-nausea medications as prescribed by your doctor, and eat small, frequent meals.
- See those listed previously.

Monitoring and testing:

You will be checked regularly by your doctor while you are taking TYKERB, to monitor side effects and check your response to therapy. Periodic blood work will be obtained to monitor your complete blood count (CBC) as well as the function of other organs (such as your kidneys and liver) will also be ordered by your doctor.

How lapatinib works:

Targeted therapy is the result of about 100 years of research dedicated to understanding the differences between cancer cells and normal cells. To date, cancer treatment has focused primarily on killing rapidly dividing cells because one feature of cancer cells is that divide rapidly. Unfortunately, some of our normal cells divide rapidly too, causing multiple side effects.

Targeted therapy is about identifying other features of cancer cells. Scientists look for specific differences in the cancer cells and the normal cells. This information is used to create a targeted therapy to attack the cancer cells without damaging the normal cells, thus leading to fewer side effects. Each type of targeted therapy works a little bit differently but all interfere with the ability of the cancer cell to grow, divide, repair and/or communicate with other cells.

There are different types of targeted therapies, defined in three broad categories. Some targeted therapies focus on the internal components and function of the cancer cell. The targeted therapies use small molecules that can get into the cell and disrupt the function of the cells, causing them to die. There are several types of targeted therapy that focus on the inner parts of the cells. Other targeted therapies target receptors that are on the outside of the cell. Antiangiogenesis inhibitors target the blood vessels that supply oxygen to the cells, ultimately causing the cells to starve.

TYKERB belongs to the signal transduction inhibitor category of targeted therapies. It particularly interferes with the protein-tyrosine kinases; Epidermal Growth Factor Receptor (EGFR[ErbB1]) and of Human Epidermal Receptor type 2 (HER2 [ErbB2]).

Research continues to identify which cancers may be best treated with targeted therapies and to identify additional targets for more types of cancer.

Source: chemocare.com. Accessed 2/25/2012 and 12/6/2016