# Precision Medicine Plain Language Lexicon

(as of November 2021)

## INTRODUCTION

### Developing Plain Language, Patient-Friendly, Consistent Precision Medicine Terminology

*The Cancer Support Community (CSC) is pleased to share our Precision Medicine Lexicon – a set of plain language terms and definitions that help explain precision medicine, biomarker testing, and genetic testing. These terms and definitions were co-created with oncology providers, patients, and caregivers with the goal of establishing a set of patient-friendly, consistent terms that health care providers, patients, professional oncology associations, cancer patient advocacy groups, and industry could use for mutual understanding when communicating with the general public.*

*As precision medicine treatment options evolve, the complexity of what cancer patients and caregivers need to understand to be active members in their health care team has increased dramatically. Developing clear, consistent precision medicine terminology is critically important to ensure patients are making informed decisions and receiving optimal care. With this goal in mind, CSC worked with patients and caregivers to develop this Precision Medicine Plain Language Lexicon. We hope that this lexicon, and future iterations of it, will allow oncology professionals and patients speak in a common language, reducing confusion, streamlining communication, and improving patient and caregiver understanding of precision medicine.*

*This lexicon was developed with support and input from oncology professionals and has been subject to iterative patient and caregiver testing. Inspired by the efforts of the Consistent Testing Terminology Working Group, which included dozens of patient advocacy groups, oncology professional organizations and industry representatives, this lexicon includes the terms established by this workgroup, defines them, as well as other important terms and concepts.*

*Over 300 cancer patients and caregivers, as well as 300 members of the general public were surveyed to validate that the definitions were clear to the vast majority (81-90% overall and at least 71% of respondents reporting household income <$50k & education <Bachelor's degree). This survey also ranked preference for terms to use when there were multiple options. Nearly all terms are written at an eighth-grade reading level or below, to ensure greater and wider understanding by the general public.*

*CSC welcomes health care providers and other oncology organizations to adopt these terms and definitions in their own materials, as well as to provide your feedback, so that this can truly be a lexicon shared by all.*

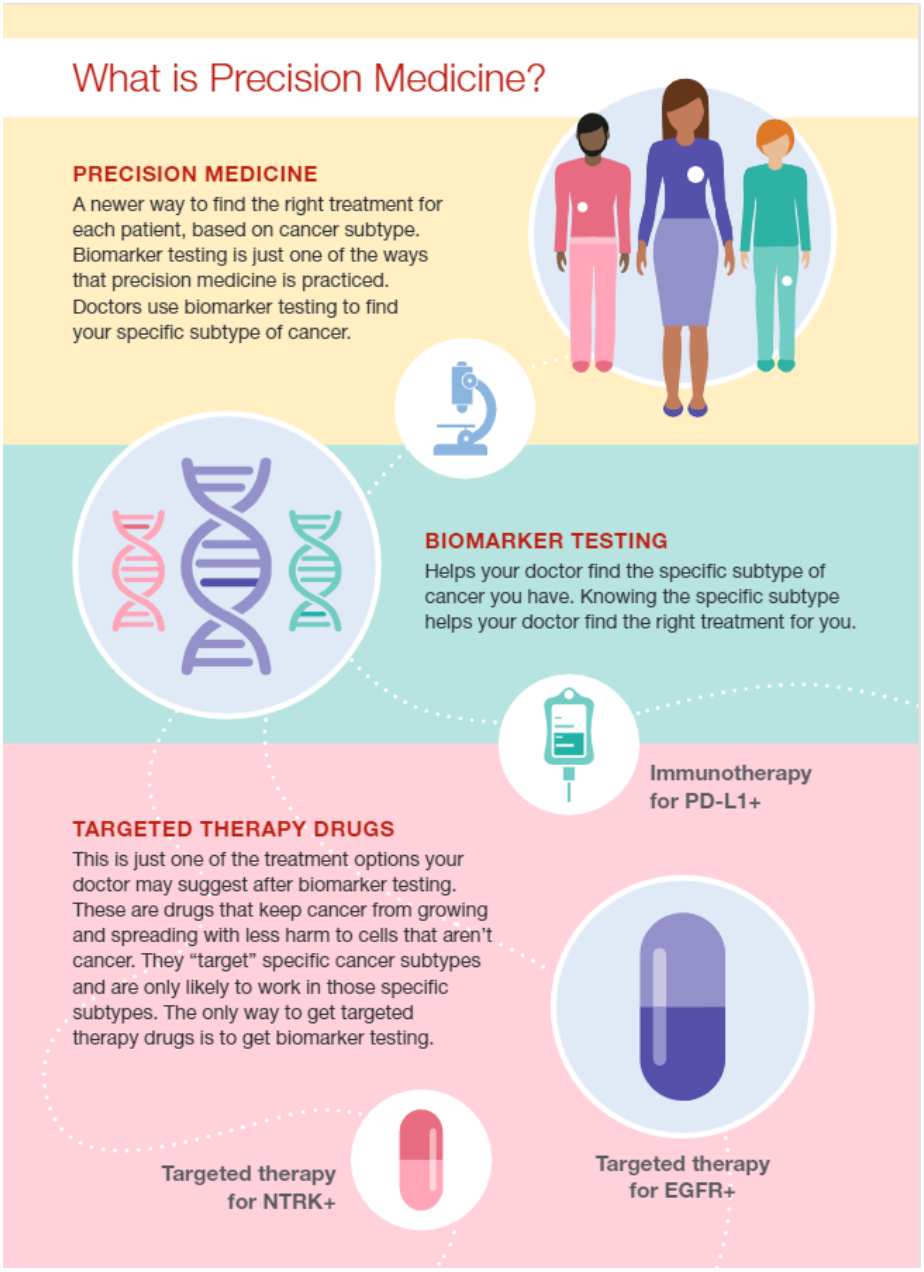
# LEXICON TERMS & DEFINITIONS

## Precision Medicine

Precision medicine is a newer way to find the right treatment for each patient, based on cancer subtype. Before, the only option was to treat all cancers of one type (such as lung or breast cancer) with the same treatment.

Instead, in precision medicine, doctors use biomarker testing to find your subtype of cancer. Results of these tests show which treatment is likely to work best for you. Precision medicine is only available for certain types and stages of cancer.

*Patients & caregivers appreciated a graphic, like the one below, to explain this concept:*



## Biomarker

A biomarker is a sign of disease or abnormal function that can be measured in your blood, tissue, or bodily fluid. In cancer, biomarkers are often used to help choose the best treatment for you. These biomarkers can be proteins, genes, or gene mutations.

Biomarkers are often referred to by a 3 or 4 letter abbreviation. Examples of biomarkers are HER2 in breast cancer or EGFR in lung cancer.

Lab results have been giving biomarker information to your doctor for over 50 years. For many cancer types and stages, it is now standard of care for doctors to test the cancer's genes for biomarkers.

## **Biomarker Testing

Biomarker testing helps your doctor match the right drugs to the specific subtype of cancer you have. In biomarker testing, a sample of your cancer is collected from your blood, bodily fluids, or tissue taken during surgery or biopsy. Your sample is sent to a lab. The test looks for biomarkers in your cancer sample. The test results can be used to help guide your treatment options. Biomarkers tell your doctor about the subtype of the cancer in your body.

**Biomarkers are often referred to by a 3 or 4 letter abbreviation. Examples of biomarkers are HER2 in breast cancer or EGFR in lung cancer. A positive test (HER2+ or EGFR+) means the cancer's genes have that mutation.*

There are many kinds of biomarker tests. Ask your doctor what kind of biomarker testing is right for your type and stage of cancer.

**If the definition of biomarker is not provided in accompanying text, then include this section in the definition of "biomarker testing."*

*** "Biomarker testing" was the term agreed upon by the Consistent Testing Terminology Working Group as an umbrella term. See also the more specific term "Testing the Cancer for Mutations.*

## ***Mutation in the Cancer (Acquired Mutation)

Two kinds of mutations can be found in cancer cells - mutations you inherit and mutations you acquire during your lifetime. Inherited mutations are found in all your cells. Acquired mutations may only be found in the **cancer's cells.** Acquired mutations happen as you get older and are the result of the wear and tear of life. These mutations were not inherited and cannot be passed on to children. Mutations in the cancer can affect how the cancer grows and spreads. These mutations can also define the cancer's subtype. Mutations in the cancer can be a type of biomarker. A biopsy sample or liquid biopsy is needed to test for mutations in the cancer.

****This definition needs more testing with patients & caregivers, to ensure this is the best definition that is not easily confused with "Inherited Mutation." CSC will be testing this definition with focus groups in*

*the near future. If you prefer to use the term "Acquired Mutation," the definition that has been tested with patients and caregivers is below:*

> Acquired mutations are one type of genetic mutation. These mutations develop over your lifetime. These mutations happen as you get older and are the result of the wear and tear of life. You do not inherit acquired mutations from your parents and you cannot pass these mutations on to children. These mutations are not found in all your cells. There may be acquired mutations in just the cancer cells. The **cancer's genes** may be tested for acquired mutations. Acquired mutations can affect how the cancer grows and spreads. These mutations can also define the cancer's subtype. Acquired mutations can be a type of biomarker.

## ***Testing the Cancer for Mutations (Comprehensive Biomarker Testing, Cancer Marker Testing)

One specific type of biomarker testing looks for mutations in the cancer. **Biomarker testing helps your doctor match the right drugs to the specific subtype of cancer you have.* This may be a targeted therapy drug or immunotherapy. **In biomarker testing, a sample of your cancer is collected from your blood, bodily fluids, or tissue taken during surgery or biopsy. Your sample is sent to a lab. The test looks for biomarkers in your cancer sample. The test results can be used to help guide your treatment options. Biomarkers tell your doctor about the subtype of the cancer in your body.*

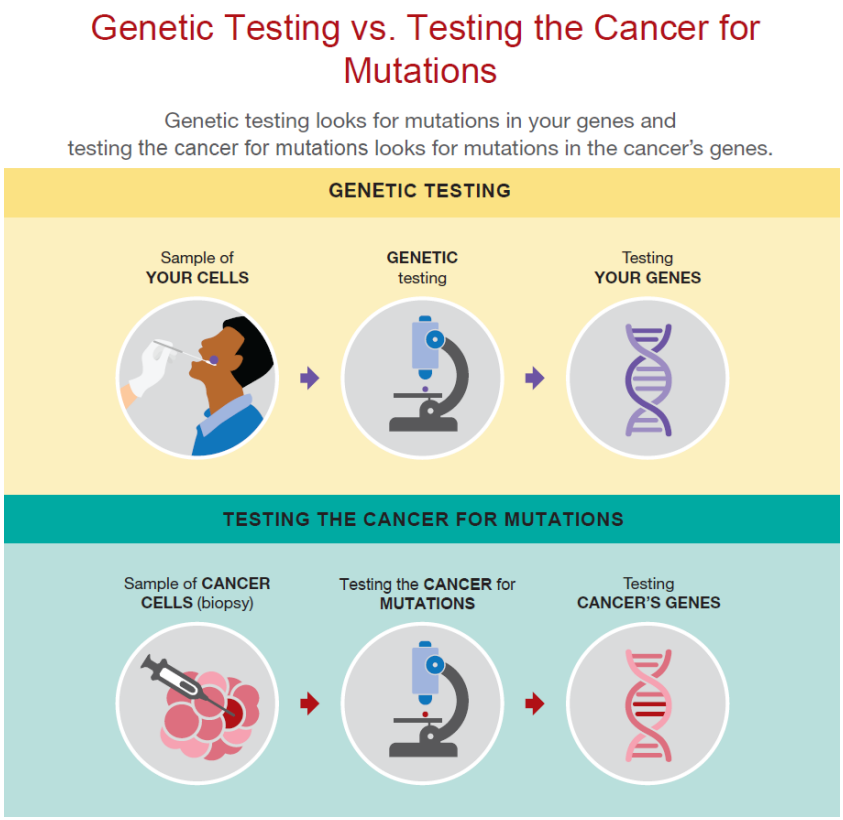
**Biomarkers are often referred to by a 3 or 4 letter abbreviation. Examples of biomarkers are HER2 in breast cancer or EGFR in lung cancer. A positive test (HER2+ or EGFR+) means the cancer's genes have that mutation.*

Your doctor may call testing that looks for the cancer's mutations *comprehensive biomarker testing*, *genomic testing*, *molecular profiling*, *cancer marker testing*, *tumor marker testing*, *genetic testing of the cancer*, *mutation testing*, or *molecular testing*. These are all the same kinds of tests. Their results help your doctor know what treatments may work best for you.

**If the definition of biomarker is not provided in accompanying text, then include these sections in the definition of "testing the cancer for mutations."*

**** The term "Testing the Cancer for Mutations" needs more testing with patients & caregivers to ensure this is the most-preferred term that is not easily confused with "Genetic Testing for Inherited Mutations." CSC will conduct further testing of this definition with focus groups in the near future.*

*Because the distinction between Genetic Testing for Inherited Mutations & Testing the Cancer for Mutations is confusing for patients, we recommend you use a graphic, like the one on the next page, to help keep things less confusing:*




## Inherited Mutation

A genetic mutation is a change in a gene. Mutations in **your genes** are inherited from your parents and can be passed on to children. **Your genes** may be tested for mutations that increase your risk of getting cancer.

## Genetic Testing for Inherited Cancer Risk*

*Testing for people who have not been diagnosed with cancer.*

In some cases, cancer runs in families. This means an increased risk of cancer is passed down from parents to their biological children. You may have heard this called "inherited cancer." What is inherited is a gene mutation (a change in your genes) that increases your risk of cancer. It does not pass down the cancer itself. Testing to see if you inherited a mutation that increases your risk of getting cancer when you have no diagnosis of cancer can be called "genetic testing for inherited cancer risk."

## Genetic Testing for an Inherited Mutation*

*Testing for people who have been diagnosed with cancer.*

In some cases, cancer runs in families. It seems to be passed down from parents to children. However, what is inherited is a mutation (change) in your genes that increases your risk of cancer. It is not the cancer itself that is inherited.

*(continued on next page)*

If you have cancer, doctors may test your genes to see if you inherited a mutation. The results of genetic tests may also help your doctor choose the right treatment option for you.

The most well-known mutation that can lead to cancer is BRCA. If you test positive to a BRCA genetic test (are BRCA+), you have a mutation in your BRCA gene. This mutation increases your risk of developing breast, ovarian, prostate, and pancreatic cancer.

Testing to see if you inherited a mutation that increased your risk of the cancer you were diagnosed with can be called "Genetic testing for an inherited mutation."

** While patients & caregivers preferred "Genetic Testing for Inherited Cancer Risk" to describe testing both for people who have not been diagnosed with cancer and for people who have been diagnosed with cancer, the Consistent Testing Working Group endorsed both terms without specifying that a distinction needs to be made between the two terms.*

## Genes

Genes carry the information that pass on traits that can be inherited from parents to children. Chemically, a gene is made of DNA. Genes affect the way our cells and bodies work.

# Cancer Types

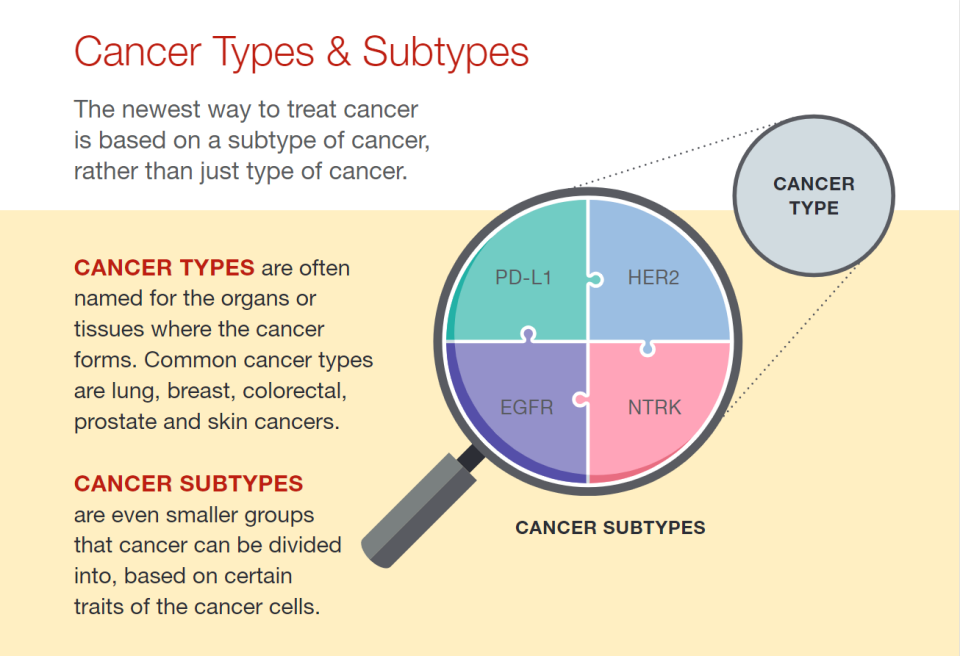
The type of cancer you have is usually named for the organ or tissues where the cancer forms. Common cancer types are lung, breast, colorectal, prostate and skin cancers.

## Cancer Subtypes

Doctors now know that there are many different subtypes of cancer. Cancer subtypes are smaller groupings than cancer type. These groupings are based on certain traits of the cancer cell. It is important to know the subtype of a cancer in order to plan treatment and determine possible outcomes. Biomarker tests can find your specific subtype of cancer.

For example, when someone with breast or stomach cancer tests positive for HER2, they have HER2+ breast or stomach cancer. Because the subtypes are the same (those cancers both have HER2 mutations), some drugs that were created to treat HER2+ breast cancer work for people with HER2+ stomach cancer. Beyond breast and stomach cancer, there are other cancer types that also have the HER2+ cancer subtype.

*Patients & caregivers appreciated a graphic, like the one on the next page, to explain this concept:*



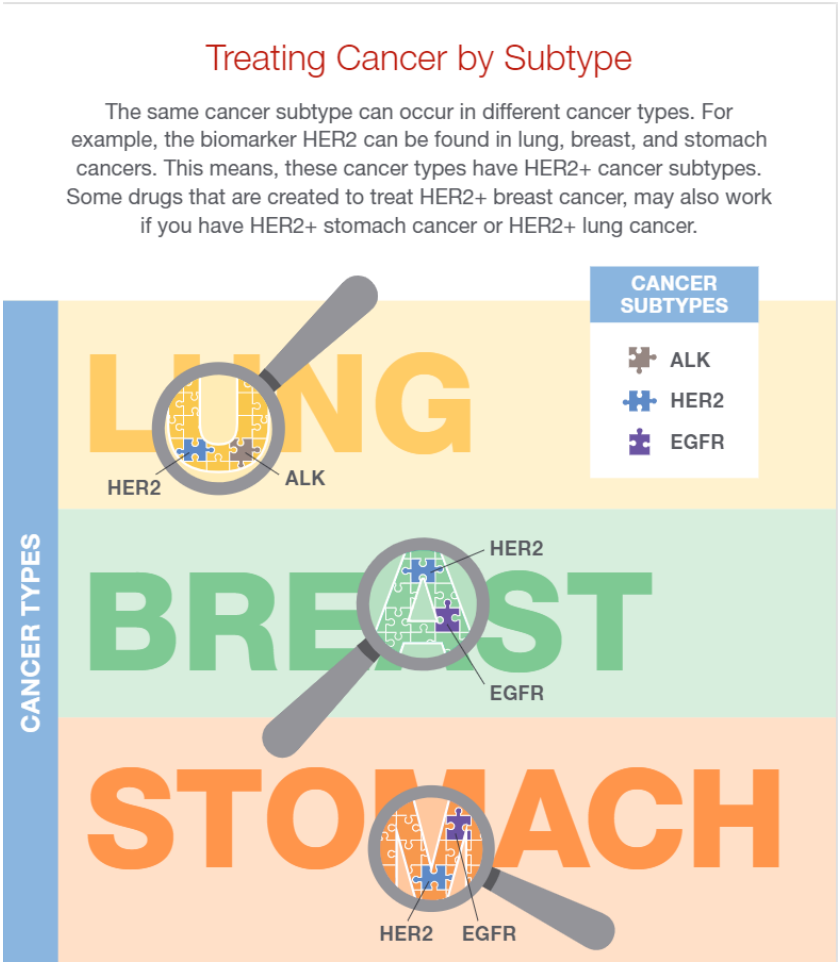

## Treating Cancer Subtypes *(concept)*

A new way to treat cancer is based on cancer subtype, rather than just type of cancer. Cancer subtypes can be identified by the presence or absence of a biomarker (a positive or negative biomarker test result). Knowing the subtype of a cancer can be helpful in planning treatment because there are treatments approved for specific cancer subtypes. For example, if your doctor tests for the biomarker ALK and the test results are positive, your cancer subtype is ALK positive (ALK+). The ALK+ cancer subtype can be found in multiple cancer types.

There are many examples of targeted therapy drugs that work in specific cancer subtypes that are found in different cancer types.

- Breast and stomach cancers can both have the biomarker HER2. This means the breast and stomach cancer both have the HER2+ cancer subtype. Some drugs that are created to treat HER2+ breast cancer may also work if you have HER2+ stomach cancer.
- There are new targeted therapy drugs approved for any cancer that tests positive for the biomarker NTRK. This cancer subtype is NTRK+.
- There is an immunotherapy drug that is approved for cancers that test positive for the biomarker MSI (this biomarker is also known as MMR). If you test positive for this biomarker, the subtype is known as “MSI-high” or “dMMR.”

*Patients & caregivers appreciated a graphic, like the one on the next page, to explain this concept:*




## Targeted Therapy Drugs

Targeted therapy drugs keep cancer from growing and spreading with less harm to cells that are not cancer. They may have fewer side effects than other treatments because they are better able to attack your cancer cells and leave healthy cells alone. These drugs "target" specific cancer subtypes. They are only likely to work in those specific subtypes.

These drugs can work in several ways:

- They can find cancer cells.
- They can destroy cancer cells directly.
- They can stop cancer cells from growing uncontrollably.
- Or they can cut off the blood supply that tumors need to grow and survive

## Solid Tumor

Solid tumor cancers are cancer types that begin in organs or tissue, not in blood cells. These kinds of cancers often develop tumors, which are masses of abnormal tissue. Examples of solid tumor cancers are:

- Lung cancer
- Skin cancer
- Breast cancer
- Prostate cancer
- Colorectal cancer

## Blood Cancer

Blood cancer begins in blood cells, in the bone marrow, or in the cells of the immune system. Blood cancers do not usually form tumors. Examples of blood cancers are:

- Leukemia
- Lymphoma
- Myeloma

## Liquid "Biopsy"

This is a biomarker test done through bloodwork. It tests tumor DNA or tumor cells found circulating in your blood. Your doctor may choose to do a liquid "biopsy," since it only needs a sample of blood. If a liquid "biopsy" comes back with a positive result, your doctor can use those results to choose treatment.

If test results are negative, your doctor may want to do a tissue biopsy. This is a test on a sample of tumor tissue. Often, doctors may order biomarker test results from both a liquid "biopsy" and a tissue biopsy at the same time. If the liquid biopsy test results come back negative, it is important to wait for the test results from the tissue biopsy before making any treatment decisions. The tissue biopsy may give your doctor more information about biomarkers.

**For example, a tissue biopsy can tell your doctor if the cancer has the biomarker PD-L1. This biomarker is important because it can help your doctor understand if some immunotherapy drugs are a good treatment option for you.*

*(*If you are working in a tumor type where PD-L1 expression is important, add this section to the definition. If not, then you don't need to add this part.)*

## Tissue Biopsy

When cells or tissues are removed and sent to a lab to see whether cancer is present. Biopsies require surgery or a needle to remove the cells or tissues. Samples from tissue biopsies can be used to test for biomarkers in the cancer.

## Need a Specialized Cancer Team *(concept)*

Not every hospital has a lab capable of testing for mutations in the cancer. If this is not an option where you are receiving care, ask if your doctor can send your samples out for testing. If you are told that testing is not an option, you should consider getting a 2nd opinion, even if it is over the phone or online, at a cancer center or hospital where these tests can be done. They can then work with your local doctor to help guide your treatment. Talking with a 2nd doctor can often help you better understand your cancer and how to treat it. A 2nd opinion can also make you feel more confident that you are making the right choices.

Ideally, you would find a whole team (doctors, nurses, dieticians, social workers, etc.) that works together with you on your care. (This is called a "multidisciplinary" team.) You need to be able to trust and talk easily with your health care team. Other reasons for deciding on your cancer care team include communication style, approach to treatment, location, insurance, and the availability of clinical trials. Here are some questions to ask cancer care team members to decide if their team is the right one for you:

1. Do you have experience working with my cancer type or subtype?
2. Do you accept my insurance?
3. How do you usually work with patients? What can you help me with?
4. What tests or treatments would you suggest for my cancer type?
5. Is biomarker testing right for me?

## Sometimes Genetic Testing for Inherited Mutations and Testing the Cancer for Mutations Look for the Same Biomarker *(concept)*

Sometimes genetic testing and testing the cancer for mutations look for the same biomarker. The most common inherited mutation associated with ovarian cancer occurs in the BRCA genes. People who inherit a BRCA1 (breast cancer gene1) or BRCA2 (breast cancer gene2) mutation are at increased risk for both breast and ovarian cancer. If you are diagnosed with cancer, there are two different tests your doctor may order. Both tests look for the BRCA mutation.

The first is a genetic test to see if you inherited a change in your BRCA gene.

Even if your genetic tests show you did not inherit a BRCA1 or BRCA2 mutation, your doctor will want to test the cancer for these mutations. There are many names for testing the cancer for mutations, like comprehensive biomarker testing, genomic testing, and molecular profiling. This kind of testing can show whether the cancer itself has a BRCA mutation (is BRCA+).

Knowing if you inherited a BRCA mutation or if your tumor developed one helps your doctor decide which treatments are best for you.

## Genetic Testing to Find the Right Treatment *(concept)*

In the past, genetic testing was only done to see if you inherited an increased risk for cancer. Now, genetic testing may also be done to help your doctors find the right treatment for you. The most well-known mutation that can lead to cancer is BRCA. If you test positive to a BRCA genetic test (are BRCA+), all your cells have a BRCA mutation. This mutation increases your risk of developing breast, ovarian, prostate, and pancreatic cancer.

If you inherited a BRCA mutation and are diagnosed with cancer, this means your cancer cells also have the BRCA mutation. By knowing you have inherited the BRCA mutation, your doctors can prescribe a targeted therapy drug that works well to treat cancer in people who are BRCA+.