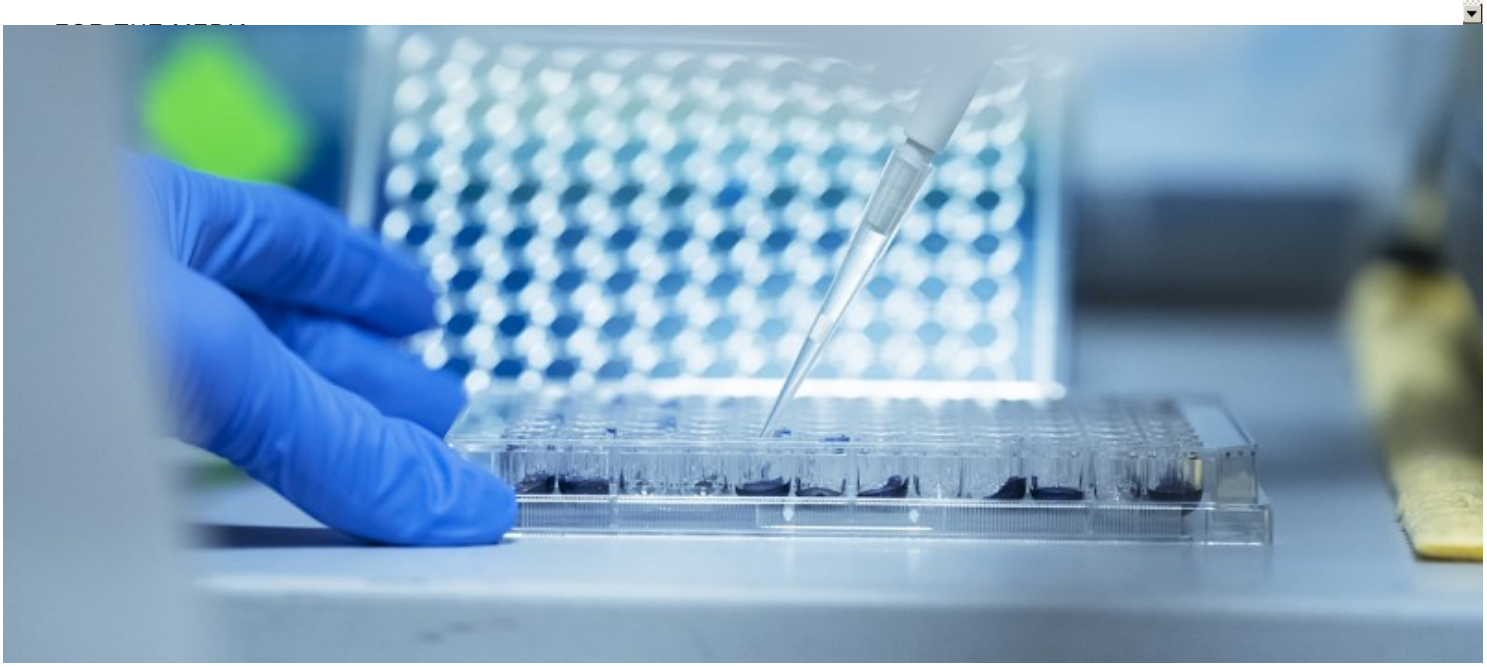

Tumor genetic testing can provide patients with a more precise diagnosis of their cancer.

If you have been diagnosed with cancer, it's important to get information about the genetic changes (mutations or variants) in your tumor. Tumor genetic profiling tests show whether cancer is caused by certain genetic changes. These DNA mutations may be inherited from your parents or acquired during your lifetime. Your Memorial Sloan Kettering Cancer Center (MSK) doctor may suggest these genetic tests, especially if cancer has spread to your lymph nodes or another body part.

What Is a Tumor Genetic Profiling Test?

A tumor genetic profiling test is often called “genomic testing” or “molecular profiling.” The test uses a sample from your tumor, your blood, or both. The tumor sample from a prior surgery or biopsy can be used, or your doctor may request a new biopsy to collect a sample for genomic testing. The blood sample test is called a liquid biopsy.

MSK’s Tumor Genetic Mutation Testing

MSK offers two next-generation DNA sequencing tests for our patients.

- MSK-IMPACT® looks for mutations in tumor cells that are linked to cancer in order to guide treatment.
- MSK-ACCESS® can do the same thing noninvasively by detecting tumor mutations in blood. It also helps doctors tell how well the cancer is responding to treatment.

What Are the Benefits of Tumor Genetic Tests?

Tumor genomic tests that use next-generation DNA sequencing give us important details about the kind of cancer you have, such as:

- A more precise diagnosis of the type of tumor that you have.
- The best treatment choices based on the tumor’s genetic profile, as well as information from MSK’s unique database called OncoKB®. This is called precision oncology.
- Which drugs are not likely to work, so you can avoid treatments you don’t need, and their side effects.
- Whether you’re a good match for one of ourclinical trials, also known as research studies. MSK has one of the largest cancer clinical trials programs in the country. Our patients have access to new treatments in development before they’re widely available.
- Information about the likely outcome of your disease (your prognosis).

Tumor genetic testing can also provide your doctor with important information that can help decide whether other treatments, including surgery or radiation therapy, are indicated.

Tumor Genetic Testing Helps MSK Treat Common and Rare Cancer Types

Tumor molecular profiling can help people with common cancers, such as lung cancer, breast cancer, colorectal cancer, and prostate cancer. Molecular profiling also can help people with rare cancers, such as soft tissue sarcoma, thyroid cancer, and metastatic melanoma (skin cancer).

Our tumor genomic tests can find common genetic mutations linked to cancer. These include changes in the genes *EGFR*, *KRAS* *BRAF*, and *PIK3CA*. Our tests can also find less common cancer mutations, such as changes in the genes *NTRK*, *ROS1*, and *ALK*.

Precision cancer treatments may be available for people with specific genetic mutations found through genomic testing. Therefore, testing is needed to identify the best treatment approach.

How Does Tumor Genetic Testing Improve Cancer Treatment?

Tumor genetic testing finds genetic mutations linked to common and rare cancers. The test results show whether a targeted therapy or immunotherapy may work for the kind of cancer you have.

Targeted Cancer Therapies

Targeted therapy drugs actually "target" a cancer mutation and stop it from driving the cancer's growth. Tumor genetic tests can show whether you're likely to respond to a certain targeted therapy. Your doctor may use MSK's OncoKB database to look up the mutations found in the tumor. Then they can match you with the drug most likely to be effective for the specific tumor you have.

In some cases, a targeted therapy helps you avoid traditional chemotherapy drugs, which can have severe side effects.

Cancer Immunotherapies

Tumor genetic tests can also show whether you're likely to respond to immunotherapy, including drugs called checkpoint inhibitors. These therapies unleash your own immune system to fight cancer.

MSK Offers 4 Different Tumor Genetic Profiling Tests

MSK offers a range of cancer next-generation sequencing tests for tumor genomic profiling. These tests were developed in our laboratories and are available only to our patients. Which tests we offer you depends on the type of cancer you have and whether you need systemic therapy like chemotherapy, targeted therapy, or immunotherapy. It also depends on other things, such as how much the cancer has spread.

MSK-IMPACT® (Integrated Mutation Profiling of Actionable Cancer Targets)

This test can find mutations and other important changes in the genes that are found in both rare and common cancers. Using just a small tissue sample, this next-generation sequencing test looks for genetic changes in 505 genes. These changes could be causing the cancer cells to grow.

The test was authorized by the U.S. Food and Drug Administration in 2017. Since then, MSK-IMPACT has been offered to more than 70,000 people with many types of cancer.

MSK-IMPACT Heme

This test uses the same technology as MSK-IMPACT. It looks for mutations and other important molecular changes in blood cancers, including leukemia, lymphoma, and multiple myeloma. It looks for mutations in 468 genes that can be present in these blood cancers. The "Heme" part of the name is short for "hematology," the study of blood.

MSK-ACCESS® (Analysis of Circulating cfDNA to Evaluate Somatic Status)

This liquid biopsy test for cancer can find small amounts of cell-free (cf) tumor DNA in the blood. It looks for mutations in 129 genes that are known to cause cancer. MSK-ACCESS is often used when it is hard to do a tumor biopsy or when waiting for a biopsy could significantly delay treatment.

Genomic testing with MSK-ACCESS offers many benefits:

This test only needs a blood sample, not a tissue sample. It's a good option for people with tumors in a location that we cannot reach during a biopsy procedure to get a tissue sample.

Unlike a biopsy procedure, MSK-ACCESS is not invasive (when we put something inside the body). That means it can be done more often, giving doctors a better picture of how well you're responding to a targeted therapy. This helps them suggest alternate treatments that could work well if the cancer develops resistance to the drug.

MSK-ACCESS can help people with advanced cancer, including tumors that spread to a few areas in their body. It gives a more complete picture of the genetic changes in all tumors, not just the tumor where the cancer started.

Results from MSK-ACCESS may be available more quickly than those for MSK-IMPACT. This lets people start on new treatments sooner.

Although MSK-ACCESS has all these benefits, MSK-IMPACT is still often considered the gold standard for tumor testing. That's because MSK-IMPACT is able to detect a greater number of mutations and can have greater sensitivity for mutation detection for some patients. Therefore, we still recommend that patients have their tumor tested with MSK-IMPACT, if possible.

It's important to note that MSK-ACCESS is not a liquid biopsy that screens for cancer. It's used to find tumor mutations in people who already have been diagnosed with cancer.

MSK-IMPACT Germline Testing for Inherited Cancers

Next-generation sequencing tests offered at most other hospitals only test tissue from your tumor. MSK-IMPACT goes an extra step. It also analyzes some of your normal tissue, usually through a blood sample.

There is a reason that MSK studies this normal tissue, too. We can tell whether the mutations in the tumor were acquired during your lifetime or were inherited from your parents. Mutations that are present in the tumor but not in normal cells are called somatic mutations. When they're found in the genes you were born with and got from your parents, they're called germline mutations.

If an inherited mutation causes the kind of cancer you have, it may be more likely to respond to certain therapies. For example:

Inherited mutations in the genes *BRCA1* and *BRCA2* mean you may be helped by treatment with drugs called PARP inhibitors. These mutations are linked to an increased risk of cancers of the breast, ovaries, prostate, and pancreas.

Inherited mutations in the genes *EPCAM*, *MLH1*, *MSH2*, *MSH6*, or *PMS2* are linked to a hereditary condition called Lynch syndrome. They may mean you're more likely to be helped by treatment with immunotherapy drugs called checkpoint inhibitors. Lynch syndrome most often is linked to colorectal cancer, endometrial (uterine) cancer, and a type of urologic cancer called upper tract urothelial cancer.

Other gene mutations are rarer and can mean you have another hereditary cancer syndrome. These include:

Inherited mutations in the gene *TP53*, which can mean you have Li-Fraumeni syndrome. This condition is linked to sarcomas of the bones and soft tissues.

Inherited mutations in the gene *CDH1*, which can mean you have a high risk of developing a rare type of stomach cancer called hereditary diffuse gastric cancer (HDGC).

People who have one of these rare mutations also may be helped by targeted therapies. Treatment may be part of standard cancer care or available through MSK's cancer clinical trials.

People with one of these inherited syndromes also may be helped by other interventions. They include getting cancer screenings more often or having surgery to stop cancer from developing in a certain organ.

An inherited mutation in your normal tissue also can affect other family members related to you by blood. Doctors and genetic counselors in MSK's Clinical Genetics Service can help you understand how these mutations can affect your blood relatives. They will talk with you about steps that should be taken to screen for cancer. The Clinical Genetics Service can also help you understand whether your family members should also be tested for an inherited mutation detected in your sample.

PREVIOUS
The Role of Pathology in Diagnosing Cancer