UNDERSTANDING CANCER TESTING AT A GLANCE

Different cancer tests answer different questions. Not every test is appropriate for every patient. This guide summarizes the purpose of common testing used in personalized cancer care.

TEST TYPE	WHAT IT LOOKS FOR	WHO/WHEN	SAMPLE	HOW RESULTS ARE USED	EXAMPLES
Germline Genetic Testing	Inherited cancer-risk variants	People meeting hereditary testing guidelines; before, during, or after diagnosis	Blood, saliva (occasionally skin biopsy)	Treatment, screening, family risk	BRCA1/2, PALB2, CHEK2, ATM, Lynch genes
Immuno-histochemistry (IHC)	Proteins in tumor cells	For some cancers at diagnosis/recurrence	Tumor tissue	Classify cancer; guidetargeted/ immunotherapy	HER2, ER, PR, PD-L1, MMR
Tumor Profiling (NGS)	Tumor DNA/RNA changes	Advanced/metastatic or selected cancers	Tumor tissue or blood	Find mutations with matching treatment (actionable)	FoundationOne® CDx, OncoExTra®, Tempus xT®, and Caris MI Profile®.
HRD Testing	DNA repair deficiency	Mainly ovarian; sometimes breast, prostate, or pancreatic	Tumor tissue	PARP inhibitor eligibility	myChoice® CDx
Risk-of-Recurrence/ Multigene Assays	Gene expression linked to recurrence	For some early-stage breast cancers after surgery	Tumor tissue	Estimate recurrence risk; chemo benefit, hormonal treatment benefit	Oncotype DX®, MammaPrint®, Prosigna®, and EndoPredict®
MRD Testing	Tumor DNA in the bloodstream	For some cancers after treatment	Blood	Detect residual disease/recurrence risk	FoundationOne * MRD, Oncodetect®, Signatera®, and Guardant Reveal®
Tumor Marker Testing	Cancer-related proteins	For some cancers during treatment/follow-up	Blood	Monitor treatment and recurrence	ER, PR, HER2, MMR proteins, PD-L1, CA15-3, CA27.29, CEA, CA-125, PSA, AFP, Inhibin A &B, and HE4, β-hCG, LDH

KEY POINTS

- Not every patient needs every test.
- Tumor marker tests are different from tumor profiling.
- NGS (tumor profiling) identifies treatment targets; multigene assays estimate recurrence risk.
- Ask your healthcare team which tests apply to your diagnosis.

IF YOU ARE AT RISK OF OR HAVE BEEN DIAGNOSED WITH BREAST CANCER OR OVARIAN CANCER AT ANY STAGE, WE CAN HELP.

Connect with others who share your experience with clinical trials through our national peer support network.

Discuss genetic concerns related to your family history and cancer risk with our genetic counselors and support staff.

Let us help you support your children through the cancer journey with parenting resources.

Create a survivorship plan tailored to your unique needs.

Learn how to address the cosmetic side effects of cancer treatment.

Join our group of women living with advanced breast cancer or recurrent ovarian cancer.

Call us for resources or with questions from family, caregivers, and friends.

Stay informed about clinical trials from experts in the cancer community through our national webinars and access transcripts from previous webinars on our website.

To find out more, call 866.474.2774, email info@sharsheret.org, or visit us at sharsheret.org.

The publication of this booklet was made possible with generous support from

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Cancer Testing:
How Hereditary and Biomarker Tests Guide Your Care



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HEREDITARY CANCER AND BIOMARKER TESTING AT A GLANCE

The different blood, tumor, genetic or other tests that your doctor orders during your diagnosis, treatment, or recurrence of cancer may be confusing. What purpose do these tests serve, and which ones do you need to have done?

Biomarkers are features found in your tumor or bloodstream that give your care team information about your cancer. They can help answer questions about the type of cancer and how aggressive it might be. Biomarker testing also helps your doctor choose the best treatment for you and avoid treatments that may not work.

Biomarker testing occurs at various times in your diagnosis and treatment. Different tests answer different clinical questions. Not all patients need every test; what tests are used depends on the type and stage of the cancer. Together, these tools make precision oncology possible, tailoring treatment to your cancer's biology. Here we will explain these tests and how they can help you.

ROUTINE MARKERS DONE AT DIAGNOSIS

IHC, or immunohistochemistry, is done at the time of diagnosis. It uses an antibody stain to show the presence of certain proteins in the tumor. In breast cancer, these proteins include ER (estrogen receptor) PR (progesterone receptor) and HER2 (Human Epidermal Growth Factor Receptor 2). Sometimes FISH (Fluorescence in Situ Hybridization) testing is necessary to confirm uncertain IHC results on HER2. IHC testing for MMR or mismatch repair proteins is done in uterine cancer, and HER2 testing may be done for some uterine cancers.

Hereditary genetic testing is usually done on a blood or saliva sample, and the tested cells are white blood cells. Testing normal cells may show the presence of something inherited. Positive results can often have an impact on treatment, as well as implications for family members. These tests are important to consider for breast, ovarian and uterine cancer.

Hereditary genetic testing is not examining the tumor but is trying to determine the likelihood that something you inherited may have led to your diagnosis. An inherited mutation may also increase your risk of a second primary cancer in the same, or in a different organ.

OTHER TESTS THAT MAY BE DONE EARLY IN THE DIAGNOSIS

Multigene genomic panels (Oncotype DX Breast Recurrence Score® test, MammaPrint, Prosigna, EndoPredict) are tests that look at the DNA or RNA of a breast tumor for specific genetic changes that can indicate the likelihood of a recurrence (when the cancer is not fully eliminated and grows back sometime after treatment). Doctors order these to test the tumor after the diagnosis if it isn't clear that chemotherapy or hormonal treatment will be beneficial. These are different from genetic tests for inherited mutations, which look for mutations such as BRCA1 or BRCA2 that run in families.

HRD, or homologous recombination deficiency, is a specific test done usually for ovarian cancer that measures deficits in DNA repair by looking for signs of genetic scarring in the tumor tissue. Examples of this testing include MyChoice® CDx, and Caris Molecular Intelligence®. It helps to find out if a class of drugs called PARP inhibitors will help slow down the cancer.

Immunotherapy biomarkers include PD-L1 (Programmed death-ligand 1) expression, MSI (microsatellite instability) and TMB (tumor mutational burden). PD-L1 is measured in an immunohistochemistry test of the tumor itself. Elevated levels of PD-L1 can help tumors evade our immune systems, which often help fight cancer cells. MSI is a genetic test of the tumor to identify the changes that result from defective mismatch repair. It is often associated with Lynch syndrome, which is a hereditary predisposition to colon and uterine cancer. TMB (tumor mutational burden) gives a score of how damaged the DNA in the tumor is overall. These three tests help physicians decide if immunotherapy drugs, like Keytruda (pembrolizumab), may be beneficial.

Tumor infiltrating lymphocytes are immune cells that can be found in tumor tissue. Tumors with these cells may show that the immune system is fighting your cancer. This may indicate a better response to chemotherapy or immunotherapy.

TESTS THAT MONITOR THE PATIENT FOR THE POSSIBILITY OF CANCER RECURRENCE

After your treatment is completed, your doctor will consider a variety of blood tests that look for evidence that the cancer may be returning.

Tumor markers are usually proteins made by both normal and cancer cells, but cancer cells often produce larger amounts. The results may be elevated for reasons other than cancer. For breast cancer, testing may include CA15-3, CA27.29 and CEA. In epithelial ovarian cancer, levels of CA-125 are assessed, although in other rarer ovarian tumor types, substances such as Alpha Fetoprotein, Beta-Human Chorionic Gonadotropin, Lactate Dehydrogenase, or Inhibin A & B are used. CA-125 combined HE4 (Human Epididymis Protein 4) may be tested for both ovarian and uterine cancer.

Minimal Residual Disease (MRD) or **Circulating tumor DNA (ctDNA)** can be measured in the blood to look for small amounts of cancer DNA that may remain in the body. In early-stage cancer, ctDNA testing may help determine whether cancer remains after surgery or treatment. In advanced cancer, ctDNA can be used to monitor how a cancer is responding to treatment and track changes over time. Some MRD tests use unique DNA sequences from an individual's tumor; these are called tumor-informed MRD tests. Examples include FoundationOne® MRD, Oncodetect®, and Signatera®.

TESTS THAT ARE MORE LIKELY TO BE DONE IF CANCER RECURS OR IS STAGE 4 AT FIRST DIAGNOSIS

Multigene biomarker tests go by many names, including genomic or molecular testing, tumor testing or profiling, comprehensive genomic profiling (CGP), and somatic testing. These tests use next-generation sequencing (NGS) to analyze tumor DNA and, in many cases, RNA for multiple genetic mutations, alterations, or deletions. They may also assess biomarkers such as tumor mutational burden (TMB) or genomic instability. Testing can help characterize a tumor, guide the use of targeted therapies, and determine eligibility for certain clinical trials. FoundationOne® CDx, OncoExTra®, and Guardant360® CDx are examples of broad molecular profiling tests.

KEY TAKEAWAYS FOR YOU

Each cancer type follows a different biomarker pathway. Some tests guide the initial treatment; others guide ongoing care. Not all tests are necessary for every patient. Together, these tools enable precise, personalized treatment decisions.