Cancer Genetics Basics

Genes

Genes are in every cell in our bodies. They are made of DNA, which tells cells how to grow and work together. You have two copies of each gene in each cell—one from your mother and one from your father. When genes work properly, they help stop cancer from developing.

Gene Mutations

Sometimes changes to genes can happen. These changes are called *mutations*. Mutations can make the genes stop working and raise the risk for certain types of cancer.

Some gene mutations raise the cancer risk a lot. Others cause a small increase in cancer risk.

Hereditary Cancer Syndromes

Some mutations can pass through families. When this happens, family members who have the mutation have a *hereditary cancer syndrome*. Hereditary cancer syndromes are rare. Only about 1 in 10 cancers come from them.

If you have a cancer syndrome, you still may not get cancer. But your odds of getting cancer are higher than for someone in the general population.

Here are some signs that a family may have a hereditary cancer syndrome:

- Several members on the same side of the family with the same kind of cancer
- Family members with cancer at a young age
  – Breast, colon, or uterine cancer before 50
- Family members with more than one kind of cancer
  – Breast **and** ovarian cancer
  – Colon **and** uterine cancer
- Family members with rare cancers
  – Ovarian cancer
  – Pancreatic cancer
  – Male breast cancer

If your family has any of these signs, ask your doctor for a referral to genetic counseling.

Do you have a personal or family history of cancer? Genetic testing and counseling may be right for you. We can help find the cancer screening plan you need. Call Huntsman Cancer Institute's Family Cancer Assessment Clinic to learn more: 801-587-9555.

Here are two common examples of hereditary cancer syndromes and the gene mutations that cause them:

- Hereditary breast and ovarian cancer—*BRCA1* or *BRCA2*
- Lynch syndrome: hereditary colon and uterine cancer —*MLH1*, *MSH2*, *MSH6*, and *PMS2*

For many cancers, mutations in any of several genes can raise the risk. For example, mutations in any of these genes can raise the risk for breast cancer:

BRCA1 *BRCA2* *ATM* *PALB2* *CHEK2*

A single gene mutation can also raise the risk for more than one type of cancer. For example, mutations in *CHEK2* raise the risk for both colon and breast cancers. Families with a history of colon cancer who have a *CHEK2* mutation may also be at higher risk for breast cancer.

Who Should Be Tested

Genetic testing is not right for everyone. Genetic counselors and doctors can talk to you about whether genetic testing could be helpful. If your family has any of the signs above, you should consider genetic testing. You always have the final decision about whether to be tested.

Genetic tests can look at one kind of gene at a time or many at once. A test for many genes at the same time is called a *multigene panel test* (MPT). An MPT can help find a hereditary cancer syndrome in a family more quickly than testing one gene at a time.

A genetic counselor will use the test results to calculate your risks for cancer. The counselor will also recommend the best screening schedule for you.

The **Genetic Information Nondiscrimination Act** (GINA) does not allow health insurance companies and employers to discriminate based on your genetic information. Genetic information cannot be considered a pre-existing condition. GINA does not apply to life, disability, or long-term care insurance.

For more patient education information: Call 1-888-424-2100 toll free • Email cancerinfo@hci.utah.edu • Visit www.huntsmancancer.org
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