

Review of Cancer Genetics

Genes are pieces of information in the cells that make up the body. Genes are hereditary, which means that they are passed to an individual through their blood relatives. Normally, genes help the cells in the body reproduce in an organized way.

Cancer develops when cells reproduce in an unstructured, abnormal way. This is the result of mutations (changes) in specific genes that control the growth of cells in the body. Therefore, all cancers are “genetic” because they involve changes in the genetic material. But it’s important to remember that the changes may have multiple causes. The three main types of cancer are: sporadic, familial and inherited.

Sporadic Cancer

Most cancer – 75 percent to 80 percent – is sporadic, meaning that it occurs by chance. People with sporadic cancer do not inherit a high risk for developing cancer from their parents. The gene changes that cause the cancer are acquired, not inherited. Families with sporadic cancer may have only a few family members with cancer. Most of these individuals are usually diagnosed at an age consistent with the general population.

Since we all have some risk of developing cancer in our lifetimes, family members of a person with sporadic cancer do not have an increased risk of developing cancer. The risk of developing cancer in these individuals is usually influenced more by medical and lifestyle factors. Family members should follow the general population recommendations for cancer screening. For more information, see M. D. Anderson’s Cancer Screening Guidelines on www.mdanderson.org.

Familial Cancer

Familial cancers account for 15 percent to 20 percent of all cancers. Unlike sporadic cancer, family members of a person with familial cancer have a moderately increased risk to develop cancer. Multiple family members on one side of the family may be diagnosed with the same cancer, but usually the cancer occurs at later ages.

Even though familial cancers cluster in a family, the cancer does not seem to be caused by a change in one gene. Instead, familial cancers are normally the result of multiple influences. A combination of several genes and other factors, such as diet and exercise, all contribute a small amount to an inherited increase in the family’s risk of developing cancer.

Researchers do not yet have the capability to test these genes or pinpoint the cause(s) of their mutation(s). Therefore, testing is not possible in familial cancer cases. Generally, family members should begin cancer screening at an age ten years younger than the earliest diagnosis in the family. For example, if a mother was diagnosed with breast cancer at age 45, her daughter should begin breast cancer screening at age 35.

Inherited Cancers

Only a small percentage of cancers – 5 percent to 10 percent – are inherited. Inherited cancers are caused when the cancer-causing gene changes are passed from one blood relative to another. This single gene change was present in the egg or sperm from which the person was conceived and is in every cell of the body. Individuals who inherit a mutation in a cancer gene have a higher risk of developing cancer and the cancer can occur at a younger age. Also, each of their children has a 50 percent chance of inheriting the gene change.

Hereditary cancers tend to differ from sporadic cancers in the following ways. In families with an inherited likelihood of developing cancer:

- Family members tend to be diagnosed with cancer at an earlier age.
- Multiple family members have the same or similar cancers.
- Cancer is more likely to develop in more than one site in the body.
- Rare cancers may occur (for example, male breast cancer)

Genetic testing is available for some hereditary cancers. Health care providers specializing in hereditary cancer syndromes can discuss appropriate testing, screening and prevention recommendations for families with hereditary cancer.

To make an appointment for a cancer genetic evaluation, please contact the Clinical Cancer Genetics Program at 713-745-7391.

For More Information on Cancer Genetics

National Cancer Institute (NCI)
(800) 4-CANCER (1-800-422-6237)
<http://www.nci.nih.gov>