

Review of Cancer Genetics

Genes are pieces of information in the cells that make up the body. Cells are the basic units of life. Normally, cells grow, divide and make more cells, and this happens in a controlled way. They make more cells only as the body needs them to stay healthy. Cancer happens when a cell grows out of control in an abnormal way.

All cancer is caused by a buildup of mutations (changes) in specific genes. Normally, these genes help the cell grow and divide in a controlled manner. The mutation in the gene damages this process and so the cell can grow out of control and become cancer.

In most people who have cancer, the gene mutations that lead to their cancer cannot be passed on to their children. However some families have a gene mutation that can get passed on from one generation to another. The following explains the differences between sporadic (non-hereditary) as well as hereditary forms of cancer. Additionally, some families have more cancer than would be expected by chance, but the cancer does not seem to be hereditary. This “familial” form of cancer is also discussed below.

Sporadic Cancer

Most cancer – 75-80 percent (%) – is sporadic. In sporadic cancer, the gene mutations that cause the cancer are acquired, not inherited. We all have some risk of developing cancer in our lifetime. Risk for sporadic cancers increases with age, and is often influenced by environmental, lifestyle, or medical factors. Cancer can sometimes happen by pure chance. Because cancer is common, it is possible for a family to have more than one member who has cancer by chance.

It is becoming more and more common for doctors to look for gene mutations in cancer cells, which may be important for treatment or prognosis. However, in sporadic cancers, the mutations are acquired and so the relatives of an individual who has a sporadic cancer will not have the same cancer-causing gene mutation. Family members should follow the general population recommendations for cancer screening. For more information, see MD Anderson’s Cancer Screening Guidelines on www.mdanderson.org.

Inherited Cancers

Only 5-10% of cancers are inherited. Inherited cancers are caused when the cancer-causing gene mutation was present from birth and is in every cell of the body. Usually, the mutation was passed from a parent to their child. Because of this, there is usually a recognizable pattern of

cancer on one side of the family.

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

- The age cancer is diagnosed is usually younger than in sporadic forms of cancer (often younger than age 50).
- Multiple family members have the same or related types of cancer.
- 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 a special blood test that can help detect gene mutations that cause hereditary forms of cancer. Genetic testing is best started in a family in a person who has already had cancer. If a hereditary condition is diagnosed, it can predict if that person could be at risk for another type of cancer or if other members of their family could have the same gene mutation or not. In most cases, something can be done for a person and/or their family members to help address the increased cancer risks.

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.

Familial Cancer

Certain common cancers (such as breast cancer, prostate cancer, colon cancer) may occur in more than one member of the same family, but are not thought to be hereditary. Multiple family members on one side of the family may be diagnosed with the same cancer, but usually the cancer occurs at later ages and doesn't follow the same patterns that are seen in hereditary cases.

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 thought to be the result of multiple influences. A combination of several genes and other factors, such as diet and exercise, all contribute a small amount to increase the family's risk of developing cancer. Such families may have a moderately increased risk to develop cancer.

It is still not possible to pinpoint the exact causes of cancer in such families, and genetic testing is not typically recommended. Generally, family members may need earlier, more frequent, or more aggressive cancer screening.

For More Information on Cancer Genetics

National Cancer Institute (NCI)

800-4-CANCER (1-800-422-6237); <http://www.nci.nih.gov>

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Adapted in part from *Review of Cancer Genetics*, Emory University School of Medicine, Department of Human Genetics

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