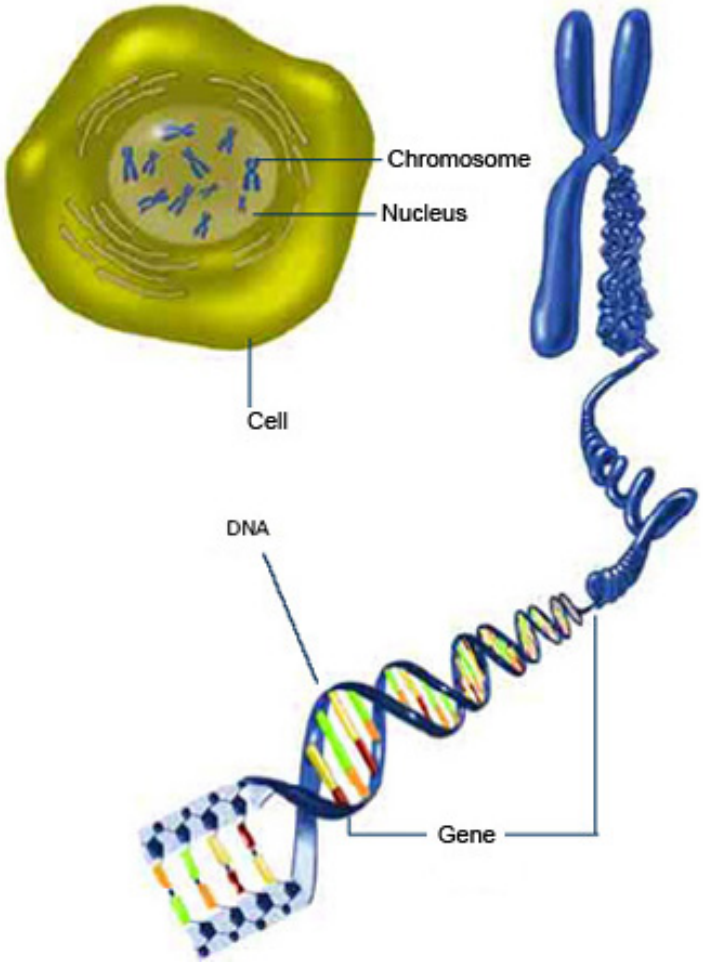
Genetics Background (Please read before the interview)

(note to IRB: this summary was authored by Mayo Clinic Genetic Counselor Ashley VanDenBoom and Medical Geneticist Noralane Lindor)

What are genes?

Our bodies are made up of billions of **cells**. In every cell of our body we have approximately 25,000 pairs of **genes**. We inherit half of our genes from our mother and half of our genes from our father. Within each gene pair, we inherit one from our mother and one from our father.

Genes are special chemicals (called DNA) that carry the information that tells our bodies how to grow and function. For our genes to work properly, the DNA that makes up the gene must have the correct structure. Sometimes a person can be born with a gene that doesn't have the correct DNA structure. This is called a gene **mutation**.



From: National Institute of General Medical Sciences, *The New Genetics*. NIH Publication No. 10-662. http://www.nigms.nih.gov

Is pancreatic cancer caused by genes?

About 1 out of 10 people with pancreatic cancer report they have a relative with pancreatic cancer. This could happen by chance alone. Another possibility is that there is a mutation in a gene that is being passed on to some members in that family that may increase the chance of getting pancreatic cancer.

Researchers are starting to identify mutations in particular genes that play a role in inherited pancreatic cancer. People who have a mutation in one of these genes are more likely to develop pancreatic cancer. Researchers at Mayo Clinic have searched for such genes in blood samples from study volunteers who have pancreatic cancer or from their relatives who volunteer for the study.

Might other genetic conditions be discovered?

In the course of doing this research, researchers have also discovered that some pancreatic cancer patients have gene mutations that are risk factors for other conditions. Researchers do not know if it is a good idea to share such information with pancreatic cancer patients or their family members. Below is a summary of some of these genes and the conditions caused when a mutation is present. When our team calls you to conduct the interview, we will discuss these three conditions.

Hereditary Breast and Ovarian Cancer Syndrome

People who have a mutation in one of their ***BRCA2*** genes have a genetic condition called Hereditary Breast and Ovarian Cancer syndrome (**HBOC**). Compared to women who do not have a mutation in this gene, women with HBOC have a higher chance to develop breast and/or ovarian cancer. Men who have a mutation in this gene also have higher risks for prostate cancer and breast cancer compared to men without mutations.

Both men and women with a *BRCA2* gene mutation also have a higher chance of developing pancreatic cancer compared to the general population.

Familial Melanoma Syndrome

Familial Melanoma Syndrome **(FMS)** can be caused by a mutation in the ***p16*** gene, also called the *CDKN2A* gene. People who have a mutation in one of their *p16* genes are more likely to develop malignant melanoma, the most serious type of skin cancer, compared to people who do not have a p16 mutation.

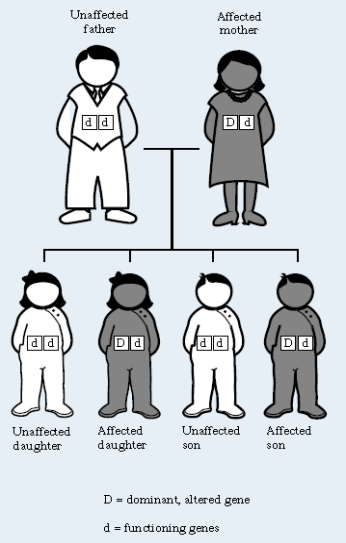
Both men and women with a *p16* gene mutation have a higher chance of developing pancreatic cancer compared to the general population.

Cystic fibrosis

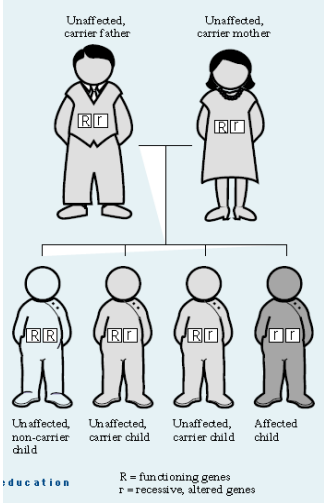
Cystic fibrosis (**CF**) is a serious, chronic lung disease in children and young adults. It causes thick, sticky mucus to build up in the lungs, digestive tract and other areas of the body. People with CF generally have a shortened lifespan. CF is caused when an individual has two gene mutations in a gene called ***CFTR***. For a person to have a mutation in both gene copies, they must inherit one mutation from their mother and one mutation from their father. People with only one *CFTR* mutation are called **carriers** and do not have CF. Traditionally, it has been thought that carriers have no health problems associated with having one *CFTR* mutation. More recently, researchers have found that carriers may have a higher risk of developing pancreatic cancer in their lifetime than people who don't carry CFTR mutations.

How are these mutations inherited?

For an individual to have HBOC or FMS, he or she needs to inherit a mutation in one copy of the *BRCA2* or *p16* gene from one parent. This inheritance pattern is called **autosomal dominant**. When a person with a mutation in the *BRCA2* or *p16* gene has a child, there is a 1 in 2, or 50% risk they will pass that gene mutation on.



Cystic fibrosis is inherited in a different way. For an individual to have CF, he or she needs to have a mutation in both copies of the *CFTR* gene. This inheritance pattern is called **autosomal recessive.** The parents of a person with CF are carriers of a *CFTR* gene mutation, meaning that they have one mutated copy and one normal copy. Each time they have a child, they have a 1 in 4, or 25% chance that they would both pass on their gene mutations and have a child with CF. They also have a 1 in 2, or 50% chance to pass on one mutated copy. In that situation, their child would also be a carrier (like the parents), but would not have CF.



Why are these other diseases of concern to the Mayo Clinic Biospecimen Resource for Pancreas Research?

While studying the genetic roots of pancreatic cancer, researchers using this research registry may identify genes that are associated with other conditions, like Hereditary Breast and Ovarian Cancer Syndrome, Familial Melanoma Syndrome, and Cystic Fibrosis.

Am I or my family members at increased risk of breast, ovarian, or prostate cancer, malignant melanoma, or cystic fibrosis?

We do not know at this time. We know that some patients and families in our research registry may be at increased risk, but most people in the research registry do not have a finding like this.