INTRODUCTION

The purpose of this program is to help you understand advances in science that may improve your health.
INTRODUCTION

In this workshop we will learn about...

1. Genes
   What are genes?
   What can our genes tell us about our health?
   What can our genes tell us about disease?

2. Personalized medicine
   What is it?
   Why would it be important to me?
   How does it work?
All living things - people, plants, and animals—are made up of cells
INSIDE OUR CELLS

• Almost every cell in our body has a nucleus

• The nucleus contains chromosomes

• Chromosomes contain DNA

• In the DNA, we will find genes, which determine our characteristics
INSIDE OUR CELLS

Genes determine what characteristics we inherit such as what we look like and how we react to things we come in contact with, like:

- the foods we eat
- the germs we encounter
- the pollutants to which we are exposed
To learn about your genes, doctors need to collect some of the cells from your body. These samples are called biospecimens.
GENETICS

The science of our genes
Have you ever wondered, “Why do I have this hair color?” or “Why do I have my Mom’s eyes or my Dad’s nose?”

This is genetics!
GENETICS

Genetics is the study of how different characteristics are passed down from grandparents to parents to children.
GENETICS

• Each of our parents gives us some of their genes

• The way our parents’ genes combine together makes each of us unique

• Unless we have an identical twin, not even our full brothers or sisters have the same combination of genes that we have
Genetics explains why family members look alike and have common features and why some diseases run in families.
Small differences in our genes are why people, animals and plants look different.

These differences are called genetic variation.
There are genetic variations that we can see...
GENETIC VARIATION

And genetic variations that we cannot see. For example, how our bodies respond to things like medicines or foods.

Peanut allergy

Lactose intolerance

Allergy to medicine
GENETIC MUTATION

Changes to our genes that can cause disease
GENETIC MUTATION

When one or more genes in the DNA in a cell is changed or becomes damaged, it is said to be mutated.

Genetic mutation is a type of variation that can lead to disease.
GENETIC MUTATION

- Damaged genes
- Damaged DNA
- Damaged cell
- Can lead to cancer
• Genes have “on” and “off” switches that tell the cell to either multiply or not multiply.

• When the “on” and “off” switches of a cell become damaged, a cell can multiply out of control and become a tumor.
GENETIC MUTATION

Cancer happens when a damaged cell from mutated genes is not removed by the body and continues to multiply out of control because the “on” and “off” switches are damaged.

A cluster of cancer cells can form a tumor.
GENETIC MUTATION

Genetic mutations occur often; usually our body is able to correct them so that they do not cause us any harm.

Gene mutations can make us susceptible to disease. Being susceptible means that we have a greater chance of getting a disease.
• When genes are mutated they have been changed or damaged and no longer work the way they should.

• There are THREE types of genetic mutation:
  – Inherited
  – Acquired
  – Sporadic
INHERITED MUTATION

• The mutated genes that can cause some breast cancers can also be inherited.

• When your doctors ask you about which diseases run in your family, they are asking you about your family history. This is the doctor’s way of knowing about your inherited mutations

• Your doctor may also recommend genetic testing
ACQUIRED MUTATION

• The environment that can damage or mutate our genes, some examples:
A sporadic mutation is a genetic mutation that happens by chance and may or may not be inherited.

A disease that occurs with no family history would be considered sporadic.
The immune system is a complicated network of cells, tissues and organs. The substances made by the immune system help the body fight infections and other diseases.

Sometimes the immune system can get rid of mutated cells, other times it cannot.

A cancer treatment called Immunotherapy uses certain parts of a person’s immune system to fight diseases such as cancer.
Over the last 20 years, there have been new scientific discoveries; this new information has helped scientists use technology to “read” the information in our genes.
Personalized medicine, also known as precision medicine, is not a “medicine”, it is a new way to look at disease prevention and treatment that can be tailored specifically to you.
PERSONALIZED MEDICINE

Personalized medicine takes into account the differences in our genes, the things that we are exposed to, and the way we live.
PERSONALIZED MEDICINE

The information provided by our genes, family history and lifestyle can be used to help us understand our risk of diseases.

This information can help doctors determine the best treatment for us.
If you are diagnosed with cancer, personalized medicine uses information about the genes in cancer tumor to find the best way to treat cancer.

There are many different types of cancers, however, all cancers to not yet have fully developed genetic tests.
Before personalized medicine, most cancers were thought to be the same and people were given the same type of treatment.

For some people, the treatment worked. For other people, the treatment did not work.
PERSONALIZED MEDICINE

There are four ways that people can react to cancer treatment. Let’s imagine that all of the people in the bucket have the same disease and receive the same treatment.

- **Medicine cures disease and has no side effects**
- **Medicine cures disease and has side effects**
- **Medicine does not cure disease, can make the disease worse, and has no side effects**
- **Medicine does not cure disease, can make the disease worse, and has side effects**
Now researchers and doctors know that the same type of cancer, for example breast cancer, does not act the same in all people.

That is because cancer in different people can have different combinations of altered genes.
In the future, researchers and doctors hope to use information about our genetic differences to understand:

– who is at risk for getting certain cancers, and
– which cancer treatments will work and which will not.
PERSONALIZED MEDICINE

By learning about
PERSONALIZED MEDICINE
and
GENETIC TESTING
we can make better decisions about our health.
Knowledge of our genetics to prevent or treat disease
GENETIC TESTING AND FAMILY HISTORY

• Genetic testing is often based on personal or family history of disease.

• Before getting genetic testing, people are asked:
  – Have you ever been diagnosed with cancer?
  – Have any of your family members been diagnosed?
  – Have you or a member of your family been told they might be at a high risk for developing cancer?
Genetic testing can:
- look for DNA mutations that can cause disease, and
- find a mutation for a disease long before someone has symptoms of the disease

Genetic testing on a tumor can:
- help doctors choose the best treatments
- tell doctors which treatments will not work
WHAT RESEARCHERS STILL DON’T KNOW

• They do not yet know all of the mutations that cause cancer

• They do not know all of the causes of cancer

• Only some cancers have tests that would find disease before it happens
HOW DO WE USE THE INFORMATION THAT WE HAVE LEARNED?

• What are some things that we can do to reduce our chances of getting cancer?

• We can:
  – Eat healthier
  – Get more exercise (30 minutes, 3 times a week)
  – Maintain a healthy weight
  – Avoid things like tobacco smoke and too much sun on your skin
  – Report our family history of disease
  – Get regular medical checkups
  – story of disease
HOW DO WE USE THE INFORMATION THAT WE HAVE LEARNED?

• Personalized medicine is important for cancer care because...
  - Doctors may be able to customize treatment to each patient’s needs
  - Doctors can learn more about the types of cells in the tumor and use medicines to treat or destroy the cancer cells
Clinical trials are how doctors find better treatments for diseases such as cancer. They also help doctors answer other questions, such as how to prevent disease or manage symptoms and side effects.
QUESTIONS?
Thank you!