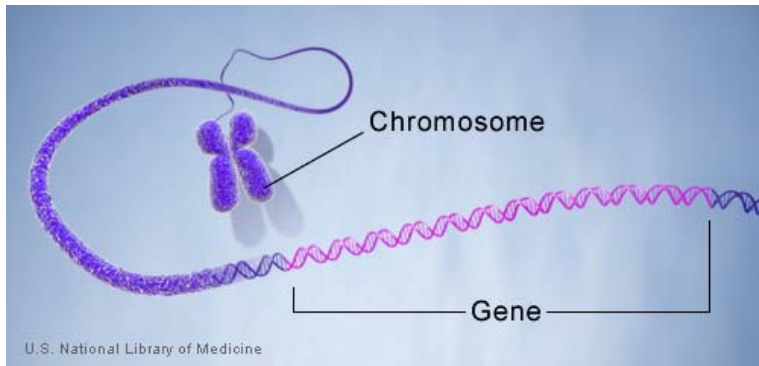
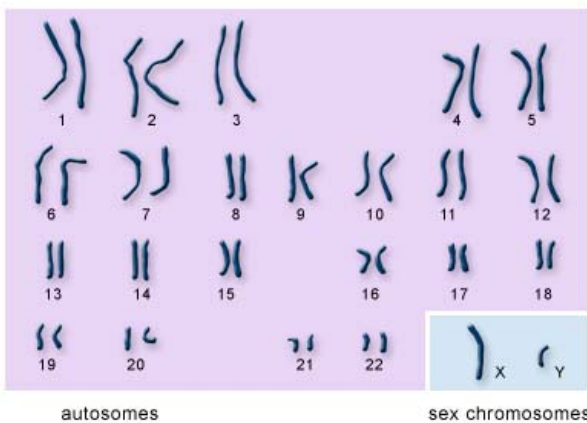
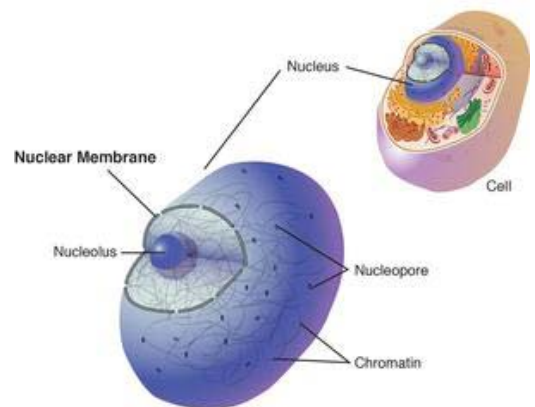


Genes: What They Are and What They Do



Each cell in the human body contains about 25,000 to 35,000 genes. They are found on tiny spaghetti-like structures called chromosomes, which are found inside cells. Your body is made of billions of cells, which are the very small units that make up all living things.

Most cells have one nucleus. The nucleus is a small egg-shaped structure inside the cell, and it has many parts. The nucleus acts like the brain of the cell. It tells every part of the cell what to do. It contains our chromosomes and genes. As tiny as it is, the nucleus has more information in it than the biggest dictionary you've ever seen.

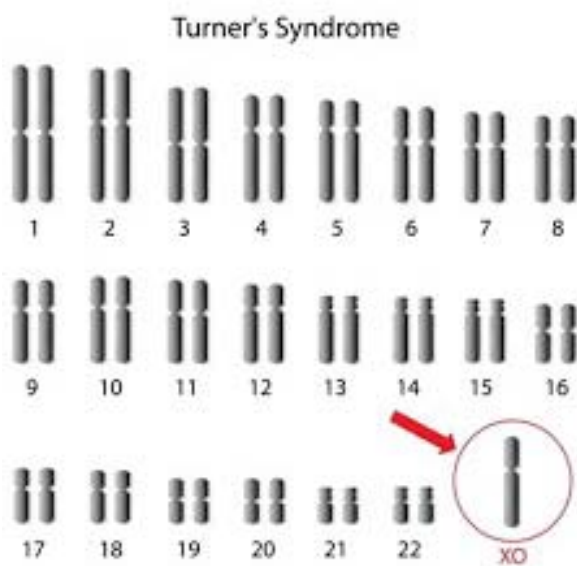


Chromosomes come in matching pairs and there are hundreds — sometimes thousands — of genes in just one chromosome. In humans, a cell nucleus contains 46 individual chromosomes or 23 pairs of chromosomes. Half of these chromosomes come from one parent and half come from the other parent.

Under the microscope, we can see that chromosomes come in different lengths and striping patterns. When they are lined up by size and similar striping pattern, the first twenty-two of the pairs are called autosomes; the final pair of chromosomes is called sex chromosomes, X and Y. The sex chromosomes determine whether you're a boy or a girl: females have two X chromosomes while males have one X and one Y.

Like chromosomes, genes also come in pairs. Each of your parents has two copies of each of their genes, and each parent passes along just one copy to make up the genes you have. Genes that are passed on to you determine many of your traits, such as your hair color and skin color.

The chromosomes and genes contain DNA. This DNA spells out specific instructions—much like in a cookbook recipe — for making proteins in the cell. Proteins are the building blocks for everything in your body. Bones and teeth, hair and earlobes, muscles and blood, are all made up of proteins. Those proteins help our bodies grow, work properly, and stay healthy. Scientists today estimate that each gene in the body may make as many as 10 different proteins. That's more than 300,000 proteins!

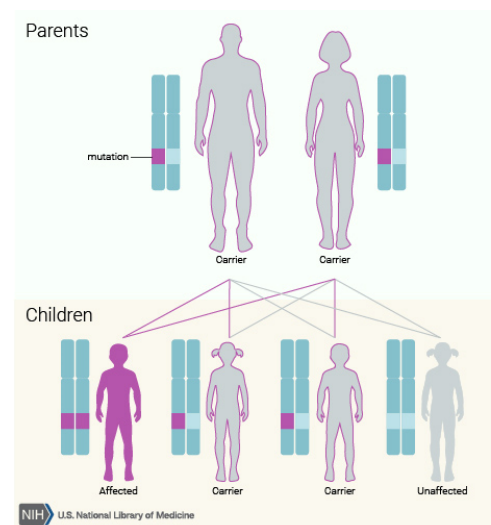


Doctors and scientists are studying genes to try to help people with hereditary problems. They want to know which proteins each gene makes and what those proteins do. They also want to know what illnesses are caused by genes that don't work right. Changes in genes are called mutations. Mutations may often be the cause of learning difficulties and many other health challenges. Other illnesses and health difficulties happen when there are missing genes or extra parts of genes or chromosomes.

U.S. National Library of Medicine

Turner Syndrome is one type of genetic condition where a girl is born with only one X Chromosome. This can make the girl short and unable to have children later in life.

Some of these gene problems can be inherited from a parent. For example, take the gene that helps the body make hemoglobin. Hemoglobin is an important protein needed for red blood cells to carry oxygen throughout the body. If parents pass on altered hemoglobin genes to their child, the child might only be able to make a type of hemoglobin that doesn't work properly. This can cause a condition known as anemia, a



Sickle cell anemia is one kind of anemia that is passed on through genes from parents to children.

condition in which a person has fewer healthy red blood cells.

Other gene problems do not come from parents but are new to the child. Copying genes over and over to make the many, many cells of the body often results in mistakes in the genes. Most of the time, the mistakes are caught and corrected by our body; sometimes they are not. This can result in a new problem in a child.

Sources

Text modified from Narcisa, Vivien L. "What is a Gene?" KidsHealth from Nemours. March 2014. Accessed August 6, 2018. <https://kidshealth.org/en/kids/what-is-gene.html>

Images:

Genetics Home Reference, Your Guide to Understanding Genetic Conditions. What is a gene? National Library of Medicine, accessed 10/15/2018. <https://ghr.nlm.nih.gov/primer/basics/gene>

"How many chromosomes do people have?" National Institute of Health. Last modified August 14, 2018. <https://ghr.nlm.nih.gov/primer/basics/howmanychromosomes>

Nucleus – National Library of Medicine. Accessed 10/15/18. ncbi.nlm.nih.gov.

Genetics Home Reference, Sickle Cell Disease. Reviewed August 2012. <https://ghr.nlm.nih.gov/condition/sickle-cell-disease#inheritance>.

"Turner Syndrome." National Institute of Health. Last modified August 14, 2018. <https://ghr.nlm.nih.gov/condition/turner-syndrome>

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