

When Genes Don't Work

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Article

Duke's New Discovery

WASHINGTON, D.C. (Achieve3000, November 30, 2007). Humans possess about 25,000 genes, which they pass from generation to generation. Genes are like blueprints or "plans" for a person's physical characteristics and biological health. Recently, scientists from Duke University in Durham, North Carolina, found 200 "problem genes" that they suspect might play an important role in people's health. These genes might even determine people's predisposition to cancer, diabetes, and other major diseases.

Humans possess two copies of each gene. One copy is inherited from the person's mother. The other is inherited from the person's father. Each gene has a specific role to play. It is "programmed" to perform a certain job at the appropriate time. Usually, both copies of a gene are active and working correctly. If one copy of the gene mutates and fails to work properly, usually the other copy of the gene takes over. In this way, the body continues to function properly.

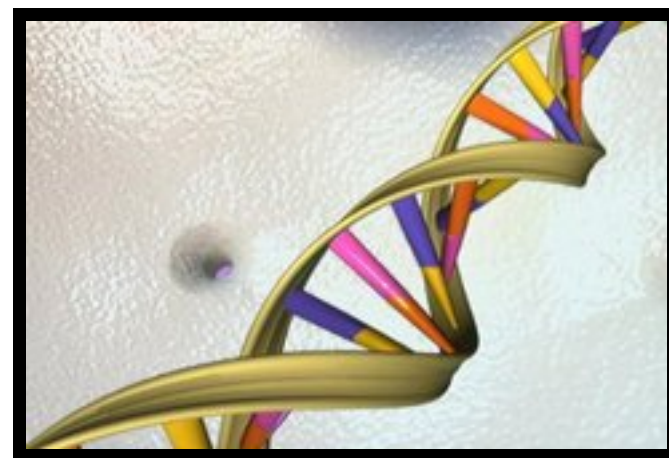
But scientists have ascertained that some individual copies of genes arrive to the body "switched off." These genes are what scientists call "silent." They are inactive and do not perform their assigned duties. They are dependent on their active partners to perform their jobs. The term used to describe the phenomenon of genes containing one active copy and one silent copy is "genetic imprinting."

Sometimes, however, genetic imprinting does not work. The copy of the gene that is supposed to be active does not function properly. As a result, the silent gene has no backup to compensate for it.

For example, say there is a gene that has the role of preventing tumors. It is an imprinted gene, meaning that one copy is active and the other silent. If the active copy becomes disabled, then neither copy does its duty. The body is then more vulnerable to tumors. Scientists believe this might explain why some people develop major diseases and others do not.

Before the Duke University study, about 40 human imprinted genes had been identified. The Duke scientists also identified 156 more of these silenced genes. Many of them have already been linked to the development of major diseases.

Now, scientists hope to discover how behavioral and environmental factors can affect someone who is prone to a health problem. Such factors include food, stress, and pollution. They know that genetic imprinting might leave someone more susceptible to a disease. They hope that behavioral factors may reduce the risk of actually developing it. These behavioral factors include eating



National Human Genome Research
Institute

Scientists hope to discover how to prevent diseases by reactivating "switched off" genes.

The Alphabet of Ancestry: A Visual Guide to Genetics

This animation reviews the basics of genetics. You will learn about the human body's cells, genes, chromosomes, DNA, and more. After the animation begins, you'll see a flashing circle on each new screen. Click each circle to continue moving through the animation screens. [View the animation.](#)

healthy foods and exercising.

So far, research indicates that imprinted genes are likely to be affected by behavioral and environmental factors. These factors may reduce the risk of actually developing some diseases. Dr. Nora Volkow is the director of the National Institute on Drug Abuse. She said that environmental factors likely determine whether someone will be healthy. She added that imprinted genes "are likely to be particularly susceptible to environmental factors."

Dr. Randy Jirtle is the Duke study's lead researcher. He agrees that environmental factors can "reprogram" how some genes operate. These factors may cause them to speed up, slow down, or work at the wrong time. Dr. Jirtle demonstrated this in an experiment. He fed female mice different foods to attempt to alter their babies' coat colors. He found that the foods indeed affected the color of the babies' coats.

Scientists hope to use the new findings to discover how to reactivate genes that are "switched off." Doctors hope that they will one day have the capability to "switch on" a gene in order to "switch off" a disease.

The Associated Press contributed to this story.

Dictionary

mutate (*verb*) to change

susceptible (*adjective*) open to harm; having the possibility of being hurt

vulnerable (*adjective*) exposed to a potential danger; unprotected from something