

Is It Your Genes or Your Diet and Lifestyle?

Is it nature or nurture? Are you overweight because of your genes or your lifestyle? The answer to this question is important in determining whether you think you can change your body through diet and lifestyle or feel doomed by the genes you inherited. The good news is that diet and lifestyle is far more important than your genes, unless you have a rare genetic disease. Genes load the gun, but environment pulls the trigger.

The best example of this is the Tarahumara Indian tribe of Northern Mexico and Southern Arizona. The Tarahumara living in Mexico live the same way that they have lived for thousands of years. They have a very low incidence of less than ten percent of modern obesity-associated conditions. They have the very same genetic background as their tribal brethren across the border living on a reservation in Arizona. The Tarahumara in Arizona have lost their traditional agricultural lifestyle and over eighty percent suffer from modern obesity-associated conditions. As populations around the world move from environments that do not promote obesity in rural areas to urban centers, the incidence of obesity increases while these populations bring their genes with them.

Human genes evolved tens of thousands of years ago after the beginning of the agricultural revolution. While agriculture provided crops, the harvest would often fail. Through multiple cycles of feast and famine, our genes adapted to survive starvation and to store fat whenever excess calories were eaten compared to the number of calories being burned.

All of the cells in your body have a substance called DNA within protected structures called chromosomes. There are 23 chromosomes in the nucleus of our cells made up of DNA we inherit from our mothers and fathers. Since there are always two copies of genes, the DNA is a double-stranded helix with one strand from your mother and the other from your father. DNA programs the manufacture of all the protein in our cells. Some proteins are part of the structure of our cells and organs. Other proteins called enzymes control the manufacture of proteins, carbohydrates, and fats in our cells by carrying out all the chemical reactions going on in our cells and organs.

Humans have about 30,000 genes. Most of the DNA in our bodies controls the activation of the genes while a subset of about ten percent actually code for proteins. There are four compounds called bases that make up DNA. They are Adenosine (A), Thymidine (T), Guanosine (G), and Cytosine (C). These can be thought of as letters in an alphabet, and our DNA sort of a ticker tape. Sets of three letter codes for a single amino acid, the building block of a protein. The DNA in a human contain about 4 billion of these letters.

All humans are 99.9 percent identical genetically. However, the 0.1 percent difference among humans is 4 million bases. Those differences account for differences in skin color, hair color, eye color, the way we breakdown nutrients and drugs in the liver, and our predisposition to many common disorders. While there are genetic disorders where a single gene is dominant and causes a serious disease, most common disorders including obesity and obesity-associated conditions are affected by many genes, each having only a small effect. In combination with what you eat and your physical activity, these multiple genes either increase or

decrease your risk of a common obesity-associated disorder.

Genes are turning on and off all the time in our cells even during a single day and there are many control systems that work on our genes. The majority of the DNA regulates the activation or inactivation of the coding process. The activation of genes to make proteins is called gene expression. Nutrition can affect gene expression through what is called epigenetics. Certain micronutrients such as folic acid and some B vitamins have been shown to silence or activate gene expression through effects on two chemical reactions called methylation and histone acetylation or deacetylation. Adding a chemical group to one of the bases (Cytosine) in multiple sites called islands, along a stretch of DNA, can affect gene expression. Histones are proteins that cover the DNA and have to come off of the DNA to enable gene expression. Many nutrients have been shown to affect these processes, including green tea and some spices.

The field of gene-nutrient interaction is an emerging science, but the take home message is this:

You can't choose your parents after you are born, but you can change your diet and lifestyle in an effort to improve your wellness.