



# The Top Six Things Everyone Should Know About Genetics

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1. **Laws of inheritance**
2. **Genes, DNA and cells**
3. **Genetic stability**
4. **Genetic variation**
5. **Genes and environment**
6. **Family history**

1. The basic **laws of inheritance** are important for individuals to understand in the context of their own genetic trait of interest or the disorder of a family member. Very briefly:
  - **Genes** come in pairs (one from mother and one from father)
  - **Chromosomes** are packages of genes (also coming in pairs)
  - **Dominant traits** require only one copy of gene to express (eg HD)
  - **Recessive traits** require a double dose (eg, CF or sickle cell)
  - **Complex traits** are caused by a combination of many genes and environmental factors
2. **Genes are made up of DNA**, and every cell in the body with a nucleus has the same complete set of genes. However, some genes are active in one organ and not another (therefore the difference between liver and lung). Genes are also turned on and off during development and in different situations like active metabolism or response to infection.
3. **Genes can change or mutate**, although this happens only rarely. Given the billions of cells, some mutation is occurring all the time. Our bodies can sometimes recognize and get rid of the cell with the mutation, but sometimes not...this is the way that cancers start. Usually the genome is stable and the genetic makeup we are born with remains throughout our life. It is this stability that makes genetic testing a little different from other medical testing (like for cholesterol or blood count).
4. Every person is born with some **genetic variations** that can be referred to as mutations. This means that we all carry some genes that are different from the majority of the population. Some of these mutations might cause disease if we had the double dose of the gene. Others are relatively "neutral" variants. This genetic variation is the basis of human variation that not only is interesting and exciting, but also allows people to adapt more readily to different environmental challenges.
5. Although our genetic makeup is constant throughout life, **our genes do not DETERMINE our future**. All genes work in the context of environment, both at the cellular and global perspectives. Alterations in environment, such as diet, exercise, exposure to toxic agents, or medications can all have influences on traits that are at least in part genetically determined.
6. While DNA and gene studies are important to the understanding of specific traits and diagnoses, **a comprehensive family medical history is probably the most useful genetic "test."** A pedigree can provide more information a large amount of information about possible risks for disorders in families. Geographic origins and ethnic background information can also be very helpful in looking for genetic variation.

Please visit the **American Society of Human Genetics** Web site at [www.ashg.org](http://www.ashg.org), or the **Genetic Alliance** Web site at [www.geneticalliance.org](http://www.geneticalliance.org) to learn more about the importance of researching your family's health history and get useful tools that will help you take a good family history.