

Genetics and Gene Therapy

Genetics

Genetics refers to the study of heredity, which is the process in which a parent passes certain traits (via genes) to their offspring. These inherited genes will become traits that will be seen in characteristics such as hair color, height, intelligence, etc. However, some genes carry diseases and disorders that could also be passed to the offspring. Such genetic diseases can include some cancers as well as mental and physical disorders (Keller, 2015).



DNA, Genes and Heredity

Your DNA is your body's blueprint and just like a blueprint of a building, your genes carry all the information to make you what you are. Inside each cell, your DNA is split into 46 chromosomes that are coiled into very dense packets. Within these chromosomes are short coding segments called genes that describe how specific traits will be displayed as you age.

Your DNA is a massive, double helix structure. If you were to stretch each chromosome out and attach them end-to-end, the DNA in each of your cells would measure 2 m long. If you attached the DNA from each of your cells into a long strand, it would measure to the Moon and back 3000 times!



The human body consists of tens of thousands of genes each of which is found inside your DNA. Your DNA consists of four chemical compounds (or bases); adenine, thymine, guanine and cytosine. Since you have two parents at conception, each parent provides a single copy of each gene, essentially giving you a duplicate blueprint with slight modifications. The DNA, which holds the genes, is broken down into forty-six chromosomes. (Mandal, 2009).

A genome is an organism's complete set of genetic information and consists of about 3.2 billion chemical base pairs (Duke, 2013) and is found in every cell. That's enough information to fill 200, 1,000-page phonebooks! Although genes are the body's blueprints, on the cellular level, their job is to simply produce proteins that conduct various processes throughout the body. These proteins may carry oxygen through the blood like hemoglobin or produce collagen that acts like glue, keeping you together. Others are responsible for the production of enzymes that aid cellular processes like digestion and other chemical reactions. Also, a gene known as a tumor suppressor produces proteins that regulate cell division. If this gene fails to function properly, uncontrolled cell division will occur which could lead to cancer.

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Future Application

Scientists have just scratched the surface when it comes to their genetic understanding and many questions are still left unanswered. Additional research and information is needed to better understand the intricate roles genes play in the creation of various diseases as well as how various genes interact with each other inside living things. Our knowledge of the genome is growing along with our technology. In 2007, the first human genome was completely sequenced at a cost of one million dollars! Today, entire genomes can be sequenced for less than \$200 and that number is quickly decreasing. However, the problem now lies in our ability to analyse the deciphered genetic code quickly and efficiency. The reason that this is an issue is the massive computing power that is needed to analyse the over three billions nucleotides. Currently, it costs around \$15,000 to have this done which decreases its availability to the public. Thankfully though, this number, like its counterpart the sequencing, is becoming less and less each year. One day perhaps, you will wear a device that continually analyses your genetic health and sends that information to your smartphone app as well as your doctor.

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Reading Comprehension Questions:

1. In your own words, describe what genetics is.
2. How is your DNA like your body's blueprint?
3. Describe
4. What
5. Why could a mutation not affect an organism at all?
6. Explain
7. In your opinion,
8. What is gene therapy?
9. What do you think of the statement:
10. What
11. Why is targeted medicine better than general (one size fits all) medicine?
12. What is your opinion on the whole "designer baby" idea? Would your answer change if instead of choosing eye color, this process prevented your child from having a genetic disorder such as Down Syndrome?

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