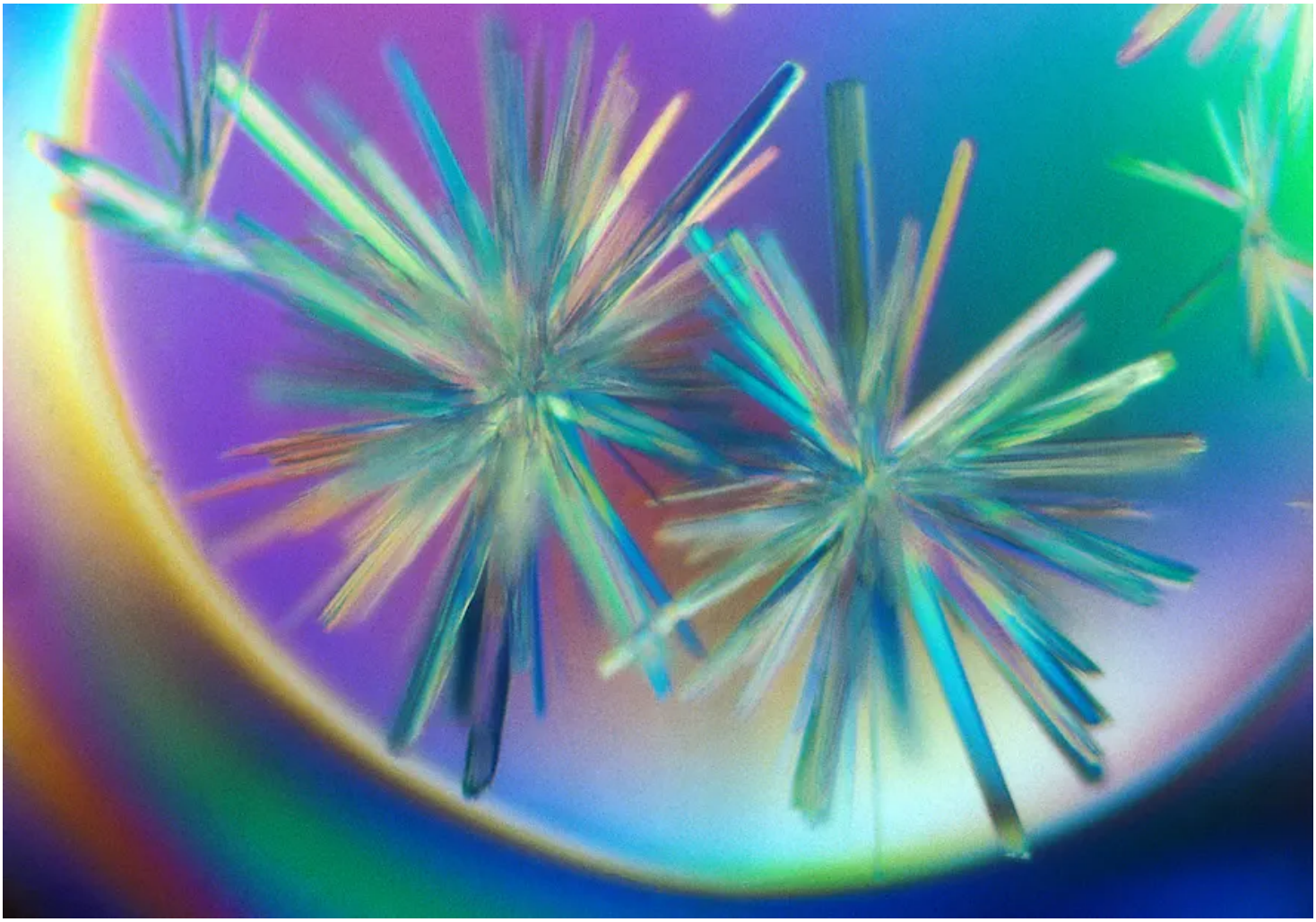
What does DNA do?

By Craig Freudenrich, How Stuff Works on 11.07.19
Word Count **355**
Level **MAX**



An illustration of the growing crystals of a DNA repair protein as it binds to DNA. Image by: Bernard O'Hara & Renos Savva/Wellcome Images/Science Source

DNA carries all of the information for your physical characteristics, which are essentially determined by proteins. So, DNA contains the instructions for making a protein. In DNA, each protein is encoded by a gene (a specific sequence of DNA nucleotides that specify how a single protein is to be made). Specifically, the order of nucleotides within a gene specifies the order and types of amino acids that must be put together to make a protein.

A protein is made of a long chain of chemicals called amino acids. Proteins have many functions. Enzymes (such as digestive enzymes) carry out chemical reactions. Structural proteins (such as collagen and nail keratin) are building materials. Transport proteins (such as oxygen-carrying hemoglobin in blood) carry substances. Contraction proteins (such as actin and myosin) cause muscles to compress. Storage proteins (such as albumin in egg whites and iron-storing ferritin in

your spleen) hold on to substances. Hormones (including insulin, estrogen, testosterone, cortisol, et cetera) are chemical messengers between cells. Protective proteins are antibodies of the immune system, clotting proteins in blood. Toxins are poisonous substances, such as bee venom and snake venom.

The particular sequence of amino acids in the chain is what makes one protein different from another. This sequence is encoded in the DNA where one gene encodes for one protein.

How does DNA encode the information for a protein? There are only four DNA bases, but there are 20 amino acids that can be used for proteins. So, groups of three nucleotides form a word (codon) that specifies which of the 20 amino acids goes into the protein (a three-base codon yields 64 possible patterns), which is more than enough to specify 20 amino acids.

Because there are 64 possible codons and only 20 amino acids, there is some repetition in the genetic code. Also, the order of codons in the gene specifies the order of amino acids in the protein. It may require anywhere from 100 to 1,000 codons (300 to 2,000 nucleotides) to specify a given protein. Each gene also has codons to designate the beginning (start codon) and end (stop codon) of the gene.

This article is available at 5 reading levels at https://newsela.com.

Write Prompt

How is it possible for proteins to have mutations or changes that can be harmful to an organism?

Make a claim. Support your claim with evidence from the article. Then, explain why the evidence supports your claim.

Write Prompt

Choose a specific detail, sentence, or paragraph in the text. Explain how this section supports the main idea of the text.

Quiz

1 Read the following selection from the article.

> *Structural proteins (such as collagen and nail keratin) are building materials. Transport proteins (such as oxygen-carrying hemoglobin in blood) carry substances. Contraction proteins (such as actin and myosin) cause muscles to compress. Storage proteins (such as albumin in egg whites and iron-storing ferritin in your spleen) hold on to substances.*

Which of the following words from the section provides context clues to the meaning of the word "contraction"?

(A) building

(B) actin

(C) compress

(D) substances

2 According to the article, our DNA determines how our bodies will make proteins. Which paragraph BEST supports the idea outlined above?

(A) DNA carries all of the information for your physical characteristics, which are essentially determined by proteins. So, DNA contains the instructions for making a protein. In DNA, each protein is encoded by a gene (a specific sequence of DNA nucleotides that specify how a single protein is to be made). Specifically, the order of nucleotides within a gene specifies the order and types of amino acids that must be put together to make a protein.

(B) A protein is made of a long chain of chemicals called amino acids. Proteins have many functions. Enzymes (such as digestive enzymes) carry out chemical reactions. Structural proteins (such as collagen and nail keratin) are building materials. Transport proteins (such as oxygen-carrying hemoglobin in blood) carry substances. Contraction proteins (such as actin and myosin) cause muscles to compress. Storage proteins (such as albumin in egg whites and iron-storing ferritin in your spleen) hold on to substances. Hormones (including insulin, estrogen, testosterone, cortisol, et cetera) are chemical messengers between cells. Protective proteins are antibodies of the immune system, clotting proteins in blood. Toxins are poisonous substances, such as bee venom and snake venom.

(C) How does DNA encode the information for a protein? There are only four DNA bases, but there are 20 amino acids that can be used for proteins. So, groups of three nucleotides form a word (codon) that specifies which of the 20 amino acids goes into the protein (a three-base codon yields 64 possible patterns), which is more than enough to specify 20 amino acids.

(D) Because there are 64 possible codons and only 20 amino acids, there is some repetition in the genetic code. Also, the order of codons in the gene specifies the order of amino acids in the protein. It may require anywhere from 100 to 1,000 codons (300 to 2,000 nucleotides) to specify a given protein. Each gene also has codons to designate the beginning (start codon) and end (stop codon) of the gene.

3 Read the list of sentences from the article.

1. *A protein is made of a long chain of chemicals called amino acids.*
2. *Structural proteins (such as collagen and nail keratin) are building materials.*
3. *Protective proteins are antibodies of the immune system, clotting proteins in blood.*
4. *The particular sequence of amino acids in the chain is what makes one protein different from another.*

Which two sentences taken together provide the BEST evidence to support the idea that proteins carry out a variety of functions?

(A) 1 and 2

(B) 1 and 4

(C) 2 and 3

(D) 3 and 4

4 Read the sentence from the article.

DNA carries all of the information for your physical characteristics, which are essentially determined by proteins.

What does the author use the word "essentially" to mean?

(A) superficially

(B) apparently

(C) basically

(D) finally