4.1: Central Dogma of Molecular Biology

Is it always DNA to RNA to proteins?

The central dogma of molecular biology. Coined by Francis Crick. And in his own words, "I called this idea the central dogma, for two reasons, I suspect. I had already used the obvious word hypothesis in the sequence hypothesis, and in addition I wanted to suggest that this new assumption was more central and more powerful."

Central Dogma of Molecular Biology

Your DNA, or deoxyribonucleic acid, contains the genes that determine who you are. How can this organic molecule control your characteristics? DNA contains instructions for all the proteins your body makes. Proteins, in turn, determine
the structure and function of all your cells. What determines a protein’s structure? It begins with the sequence of amino acids that make up the protein. Instructions for making proteins with the correct sequence of amino acids are encoded in DNA.

DNA is found in chromosomes. In eukaryotic cells, chromosomes always remain in the nucleus, but proteins are made at ribosomes in the cytoplasm. How do the instructions in DNA get to the site of protein synthesis outside the nucleus? Another type of nucleic acid is responsible. This nucleic acid is RNA, or ribonucleic acid. RNA is a small molecule that can squeeze through pores in the nuclear membrane. It carries the information from DNA in the nucleus to a ribosome in the cytoplasm and then helps assemble the protein. In short:

DNA → RNA → Protein

Discovering this sequence of events was a major milestone in molecular biology. It is called the central dogma of molecular biology. You can watch a video about the central dogma and other concepts in this lesson at this link: http://www.youtube.com/watch?v=ZjRCmU0_dhY (8:07).

The vocabulary of DNA, including the two processes involved in the central dogma, transcription and translation, is discussed at http://www.youtube.com/watch?v=s9HPNwXd9fk (18:23).

An overview of protein synthesis can be viewed at http://www.youtube.com/watch?v=-ygpqVr7_xs (10:46).

Summary

• The central dogma of molecular biology states that DNA contains instructions for making a protein, which are copied by RNA.
• RNA then uses the instructions to make a protein.
• In short: DNA → RNA → Protein, or DNA to RNA to Protein.

Making Connections

Explore More
Explore More I

Use this resource to answer the questions that follow.

- **What Makes a Firefly Glow?** at http://learn.genetics.utah.edu/conte...n/dna/firefly/.

  1. What happens during transcription?
  2. What happens to the mRNA after transcription?
  3. What is a ribosome?
  4. What happens during translation?

Explore More II

- **How Do Cells Make Proteins?** at http://ca.pbslearningmedia.org/con...d2c73bce006585.
- **DNA to Protein** at http://www.concord.org/activities/dna-protein.

Review

1. State the central dogma of molecular biology.
2. What are transcription and translation?
3. Explain the central dogma of molecular biology.