The Central Dogma of Molecular Biology

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Introduction

The Central Dogma of Molecular Biology is DNA $\rightarrow$ RNA $\rightarrow$ Proteins.

To explain further, it's essentially stating
1. RNA copies the instructions to make a protein from DNA.
2. RNA uses those instructions to make a protein.

in chronological order.

Comparing and Contrasting DNA and RNA

DNA	RNA
Deoxyribose	Ribose
2 Strands	1 Strand
A, T, C, G	A, U, C, G

Nitrogenous Base Pairs of DNA and RNA

DNA	RNA
Adenine	Adenine
Thymine	Uracil
Cytosine	Cytosine
Guanine	Guanine

In DNA, adenine always pairs with thymine, and cytosine always pairs with guanine.

In RNA, adenine always pairs with uracil, and cytosine always pairs with guanine.

Transcription

Definition (Transcription)

"In **transcription**, the DNA sequence of a gene is transcribed (copied out) to make an RNA molecule." - Khan Academy

Example

Find the corresponding mRNA molecule to the following DNA sequence of a gene:

$$ATGCCGCTATC$$

1. A(denine) pairs with U(racil)

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2. T(hymine) pairs with A(denine)
3. G(uanine) pairs with C(ytosine) and vice versa

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4. Utilizing this information, the corresponding mRNA molecule would be

UACGGCGAUAG

RNA Splicing

After transcription, two nucleotide sequences are present in the mRNA molecule: Introns and Exons.

Now, introns are irrelevant to the development of proteins, whereas the exons contribute to the development of proteins.

Thus, we want to get rid of the introns and we want to keep the exons. We do this by RNA Splicing.

Codons

Definition (Codon)

"A **codon** is a trinucleotide sequence of DNA or RNA that corresponds to a specific amino acid." - National Human Genome Research Institute

Consider the following mRNA molecule:

$$AUGACGGUUUGA$$

Our codons are AUG, ACG, GUU, and UGA.

1. AUG – Start Codon (Codes for Methionine)
2. ACG – Codes for Threonine
3. GUU – Codes for Valine
4. UGA – Stop/Termination Codon

AUG is *always* the start codon.

There are three stop/termination codons: UGA, UAG, UAA.

tRNA

Developing Proteins

The genetic code contains the set of instructions to develop the protein, with the exons contributing.

Once the protein is fully developed, this completes the Central Dogma of Molecular Biology Process, and it repeats further for other DNA sequences.