

Protein Synthesis: An Overview

- there are two stages:
- Transcription involves the copying of the DNA information into another molecule called messenger RNA and
- Translation involves the synthesis of proteins from amino acids by using the messenger RNA as a blueprint
- see Fig. 1 on pg. 237

Ribonucleic Acid (RNA)

- a carrier of genetic information
- the molecular structure of RNA differs from that of DNA in three important ways:
 1. RNA is single-stranded, rather than double stranded.
 2. The sugar in RNA is ribose (there is an additional hydroxyl group on carbon #2), rather than deoxyribose.
 3. RNA contains the base uracil instead of thymine when it pairs with adenine.
- see Fig. 3 on pg. 238
- there are three classes of RNA molecules:
 - messenger RNA (mRNA) - carries the message of what amino acids need to be assembled
 - ribosomal RNA (rRNA) - an important structural component of ribosomes (organelle that assembles the proteins)
 - transfer RNA (tRNA) - transfers the amino acids to the ribosomes

Transcription and Translation: An Overview

Transcription

- occurs in the nucleus of cells
- has three processes:
 1. initiation involves RNA polymerase binding to DNA at a specific site called the promoter, located near the beginning of the gene.
 2. elongation involves RNA polymerase assembling the appropriate ribonucleotides to build the mRNA.
 3. termination involves RNA polymerase recognizing the end of the gene.

Translation

- occurs in the cytoplasm of cells
- has three main stages:
 1. initiation involves the ribosome binding to the mRNA, and then moving along the strand reading 3 nucleotides at a time.
 - see Fig. 6 on pg. 239
 2. elongation involves the tRNA delivering the appropriate amino acids to create the polypeptide.
 3. termination occurs when tRNA reaches a 3 base sequence that signals for it to stop, and the polypeptide is released.

The Genetic Code

- a codon is a sequence of three nucleotides
- there are 64 different possible combinations (4^3) to code for 20 amino acids
- Fig. 3 on pg. 240 shows the table in which the codes for all 20 amino acids can be found
- some amino acids have more than one codon coded for it
- this helps to minimize errors
- one codon serves as a start codon (AUG - methionine) and three codons serve as a stop codon.

Seatwork

Pg. 236 # 1, 5 -7

Pg. 241 # 1 - 11, 13, 14

Teacher's Note

- Sickle Cell anemia is an example of one error in the gene sequence that results in a malfunctioning polypeptide
- the hemoglobin molecule on the red blood cells, become hard and sticky after releasing the oxygen molecule, making it difficult to flow through the blood vessels
- the individual becomes anemic since the red blood cells do not replenish themselves quickly enough (normal RBC live 120 days and sickle cells live 10 - 20 days)
- sickle cell anemia is a recessive disorder (must be inherited from both parents)
- some genetic disorders are a result of more than one mutation in the gene.
- Beadle and Tatum's work showed that mutations act through enzymes and not directly on phenotype as was previously believed