19.7: Polypeptide and Protein Synthesis

DNA is divided into functional units called genes. A gene is a segment of DNA that codes for a functional product (mRNA, tRNA, or rRNA). Since the vast majority of genes are transcribed into mRNA and mRNA is subsequently translated into polypeptides or proteins, most genes code for protein synthesis. The term polypeptide refers to many amino acids connected by peptide bonds. While all proteins are polypeptides, not all polypeptides are proteins. In some cases, smaller polypeptides coded for by two or more genes must be joined together to produce a functional protein. In other cases, as will be mentioned below, mRNA carries a transcript of several genes resulting in the synthesis of a large polypeptide that must subsequently be cleaved by enzymes called proteases into two or more smaller functional proteins. For simplicity, we will use the term protein when referring to the end product of transcription and translation. In this section we will see how the sequence of deoxyribonucleotide bases along one strand of DNA ultimately codes for the amino acid sequence of a particular polypeptide or protein.

During protein synthesis, the order of nucleotide bases along a gene gets transcribed into a complementary strand of mRNA which is then translated by tRNA into the correct order of amino acids for that polypeptide or protein. Therefore, the order of deoxyribonucleotide bases along the DNA determines the order of amino acids in the proteins, that is, its primary structure. Because certain amino acids can interact with other amino acids, the order of amino acids for each protein determines its final three-dimensional shape, which in turn determines the function of that protein. Protein synthesis can be divided into two stages: transcription and translation. In the next two sections we will look at these stages in greater detail.

- Topic hierarchy
Contributors and Attributions

- Dr. Gary Kaiser (COMMUNITY COLLEGE OF BALTIMORE COUNTY, CATONSVILLE CAMPUS)