

capitolo 12 Il linguaggio della vita e dell'evoluzione

verifica la comprensione

Leggi il brano e rispondi alle domande.



The physical basis of heredity

DNA represents a type of information that is vital to the shape and form of an organism. It contains instructions in a coded sequence of nucleotides, and this sequence interacts with the environment to produce form—the living organism with all of its complex structures and functions. The form of an organism is largely determined by protein.

A large proportion of what we see when we observe the various parts of an organism is protein; for example, hair, muscle, and skin are made up largely of protein. Other chemical compounds that make up the human body, such as carbohydrates, fats, and more-complex chemicals, are either synthesized by catalytic proteins (enzymes) or are deposited at specific times and in specific tissues under the influence of proteins. For example, the black-brown skin pig-

ment melanin is synthesized by enzymes and deposited in special skin cells called melanocytes. Genes exert their effect mainly by determining the structure and function of the many thousands of different proteins, which in turn determine the characteristics of an organism.

Proteins are polymeric molecules; that is, they are made up of chains of monomeric elements, as is DNA. In proteins, the monomers are amino acids. Organisms generally contain 20 different types of amino acids, and the distinguishing factors that make one protein different from another are its length and specific amino acid sequence, which are determined by the number and sequence of nucleotide pairs in DNA. In other words, there is a colinearity (parallel structure) between the polymer that is DNA and the polymer that is protein.

Hence, genetic information flows from DNA into protein. However, this is not a single-step process. First, the nucleotide sequence of DNA is copied into the nucleotide sequence of single-stranded RNA in a process called transcription. Transcription of protein-coding genes results in a type of RNA called messenger RNA (mRNA), so named because it carries a genetic message from the gene on a nuclear chromosome into the cytoplasm, where it is acted upon by the protein-synthesizing apparatus.

Hereditary information is contained in the nucleotide sequence of DNA in a kind of code. The coded information is copied faithfully into RNA and translated into chains of amino acids. The specific amounts of amino acids in a protein and their sequence determine the protein's unique properties.

If the nucleotide sequence of mRNA is thought of as a written message, it can be said that this message is read by the translation apparatus in "words" of three nucleotides, starting at one end of the mRNA and proceeding along the length of the molecule. These three-letter words are called codons. Each codon stands for a specific amino acid, so if the message in mRNA is 900 nucleotides long, which corresponds to 300 codons, it will be translated into a chain of 300 amino acids.

(www.britannica.com)

- What is the content of a DNA molecule?
- To what extent non-proteic organic compounds depend on proteins?
- How is genetic information translated into proteins?

