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Opinion

Fundamental Use of Nucleic Acids in Biological Processes

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INTRODUCTION

In several fundamental biological processes, such as transcription and translation, Nucleic Acids (NAs) play crucial functions. In addition to storing genetic information (DNA) and decoding it (RNA), they carry out a variety of architectural, catalytic, and regulatory tasks in the cell. Beyond the conventional duplex or single-stranded RNA shape, NAs assume a wide range of configurations to carry out these functions. They are extremely dynamic biopolymers that may respond to biological signals by changing their conformation in a variety of ways that are encoded in their sequence. These modifications can be further influenced by the environment, the presence of altered and damaged nucleotides, the dissipation of cellular pressures, the regulation of catalytic activity, or the dictation of recognition by ligands. Understanding the dynamics, interactions, and structure of DNA and RNA in great detail is, therefore, key to understanding their physiological roles in health and disease.

Deoxyribonucleic Acid (DNA) and ribonucleic acid are the two different forms of nucleic acids (RNA). Both are essential to every activity carried out by every living thing. Although nucleic acids have similar fundamental structures, they differ significantly. They are made of monomer nucleotides that are linked together to form nucleic acid polymers, much like links in a chain. A nucleoside, which is made up of a pentose monosaccharide molecule and a nitrogenous base, and a phosphate group make up nucleotides. A single nitrogenous base and a single oxygen atom within a sugar molecule distinguish RNA from DNA.

DESCRIPTION

Nucleic acid is naturally occurring; it can be broken down into phosphoric acid, sugars, and a variety of organic bases (purines and pyrimidines). Because they control the creation of proteins, nucleic acids-the primary information carrying molecules of the cell determine the inherited traits of every living creature. Deoxyribonucleic Acid (DNA) and ribonucleic acid are the two primary types of nucleic acids (RNA). All free living organisms and the majority of viruses have genetic material made up of DNA, which is the ultimate life-plan. RNA is the genetic material of some viruses, but it is also present in all living cells and is crucial to many biological activities, including the synthesis of proteins.

Polynucleotides, or long, chain like molecules made of several, virtually identical nucleotides, are what make up nucleic acids. Each nucleotide is made up of a pentose (five-carbon) sugar connected to a phosphate group, which is then bonded to an aromatic base with nitrogen. Adenine (A), Guanine (G), Cytosine (C), Thymine (T), and uracil are the four nitrogen-containing bases that are present in each nucleic acid out of a possible five (U). While C, T, and U are collectively referred to as pyrimidines, A and G are classified as purines. The nucleotides A, C, and G are present in all nucleic acids; T, on the other hand, is only present in DNA, while U is only present in RNA. The absence of a hydroxyl group (OH) on the 2′ carbon of the sugar ring distinguishes the pentose sugar in DNA (2′-deoxyribose) from the sugar in RNA (ribose). A nucleoside is a sugar that is joined to one of the bases but does not have a phosphate group. The phosphate group joins the following sugar residues in the chain by forming a bridge between the 5′-hydroxyl group on one sugar and the 3′-hydroxyl group on the following sugar. Both RNA and DNA include these phosphodiester bonds, which are nucleoside connections.

CONCLUSION

Circular or linear DNA molecules can be found in nature. Circular molecules make up the genomes of several functional cell structures, such as mitochondria and chloroplasts, as well as single-celled bacteria and archaea (the prokaryotes). The tiny circular DNA molecules known as plasmids, which are found in some bacteria and archaea and typically only include a few genes, are another type of molecule. A large number of plasmids are easily transferred between cells. The entire genome of a typical bacterium is encoded by a single, continuous circular molecule that has between 500,000 and 5,000,000 base pairs. Most eukaryotes and certain prokaryotes have linear DNA molecules called chromosomes in their genomes. Human DNA, for example, consists of 23 pairs of linear chromosomes containing three billion base pairs.

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