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Role of Microbial Biological Macromolecules in Metal Bioremediation

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DESCRIPTION

The rapid progress of molecular biology owes much too ground-breaking techniques that have allowed scientists to manipulate and analyse genetic material at unprecedented levels of precision. The advent of Polymerase Chain Reaction (PCR) in the 1980s revolutionized DNA amplification, enabling the production of millions of copies of a specific DNA segment. This technique has been instrumental in applications ranging from genetic testing to forensics. Another milestone is the development of recombinant DNA technology, which allows the combination of DNA from different sources. This has paved the way for genetic engineering, enabling the creation of genetically modified organisms with enhanced traits, and the production of valuable proteins such as insulin through biotechnology. Molecular biology has revolutionized medicine by providing insights into the molecular basis of diseases. Through techniques like gene sequencing and genome-wide association studies, researchers can identify genetic variants associated with various disorders. This knowledge has opened the door to personalized medicine, where treatments can be tailored to an individual's genetic makeup. Infectious diseases have also come under the scrutiny of molecular biologists. Understanding the molecular mechanisms of pathogens has led to the development of targeted therapies and vaccines. The ongoing COVID-19 pandemic has highlighted the crucial role of molecular biology in rapidly characterizing the virus and developing effective countermeasures. In recent years, the revolutionary gene-editing tool CRISPR-Cas9 has captured the imagination of scientists and the public alike. Derived from a bacterial defence mechanism against viruses, CRISPR-Cas9 allows precise modification of DNA sequences. This breakthrough has far-reaching implications, from correcting genetic defects to engineering drought-resistant crops. However, the technology also raises ethical questions regarding its potential misuse and unintended consequences. As the tool continues to evolve, molecular biologists, ethicists, and policymakers must collaborate to ensure its responsible and ethical application. Complementary base pairing-adenine with thymine and cytosine with guanine-ensures faithful replication and transmission of genetic information during cell division. RNA, the molecular cousin of DNA, plays a vital role in translating genetic information into functional proteins. Messenger RNA (mRNA) carries the instructions for protein synthesis from the DNA in the cell's nucleus to the ribosomes in the cytoplasm. Carbohydrates are essential sources of energy for cells. Glucose, a simple sugar, is a primary fuel that powers cellular activities. Carbohydrates also play critical roles in cell adhesion and recognition, influencing processes such as immune responses and cell signalling. The branching structure of carbohydrates allows them to store energy efficiently. In plants, starch serves as an energy storage molecule, while animals store glucose as glycogen in the liver and muscles. Lipids are hydrophobic molecules that serve diverse functions. Phospholipids, for example, are essential components of cell membranes. These molecules have a hydrophilic (water-attracting) "head" and hydrophobic (water-repelling) "tails," which form the lipid bilayer that constitutes cell membranes. Fats, another class of lipids, serve as energy storage molecules. They also provide insulation and cushioning for vital organs. Steroids, a subgroup of lipids, play roles in hormone production and regulation. The functioning of living organisms is a result of the intricate interplay between different types of biological macromolecules. For instance, enzymes, which are proteins, are responsible for catalysing reactions involved in carbohydrate breakdown to release energy.

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CONFLICT OF INTEREST

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