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Recent Advancements in Microbiology

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Description

Microbes drive all aspects of life on earth. Finding solutions too many of our global challenges, such as the rise of antimicrobial resistance, the emergence of new infectious diseases, and the health of our planet's ecosystem, will depend on the findings of basic microbial research.

Microbiology is the biology of studying microorganisms, viruses, bacteria, algae, fungi, slime molds and protozoa. The methods used to study and manipulate these tiny and mostly single-celled organisms are different from those used in most other biological research. Recombinant DNA technology uses microorganisms, especially bacteria and viruses, to amplify DNA sequences and generate encoded products. To transfer genes from one microorganism to another, or to amplify them within a microorganism, microbiological skills can be applied to solve medical and environmental problems. Many microorganisms are unique in biology because they can use the nitrogen in the air to meet their nutritional needs or decompose complex macromolecules in materials such as wood. By rearranging the genes that control these and other processes, scientists seek to design microorganisms to treat waste, fertilize farmland, produce needed biomolecules, and solve other problems in an economical and safe manner.

Microorganisms are a key component of the aquatic environment. As the most important primary producer, microorganisms are responsible for photosynthesis to fix carbon dioxide in organic matter. It is estimated that aquatic primary production accounts for about 50% of all primary production on the planet. As will be seen, microorganisms are also the most important consumers, responsible for collecting organic matter produced in primary production and converting it into carbon dioxide through respiration.

In the field of medical microbiology, a pioneering study explored the immuno-modulatory properties of a mixture of lactic acid bacteria with probiotic properties in macrophage-like cell in vitro models and chemically induced colorectal cancer models. Another interesting study reported on the hepato-protective properties of dietary *Clostridium butyricum*; this effect is mediated by regulating genes and pathways related to immune regulation and lipid metabolism. The underlying mechanism of the antibacterial activity of Manuka honey; it induces changes in the metabolism of *Staphylococcus aureus*, and can block the efflux pump activity in a dose-dependent manner in *E. coli*. Also within this range, the diversity of endophytic fungi produced by the medicinal plant *Schinus terebinthifolius*, the compounds produced by endophytes and their antibacterial and antioxidant activities were analyzed.

Traditional microbiology is a laborious, expensive, and time-consuming task. For example, a food sample is homogenized and a series of dilutions are prepared before inoculating onto an agar plate, and then incubated for 24 h-48 h. Then count the previous colonies and calculate their level in the initial sample. For pathogen screening, due to the need to detect low levels, a 24-hour pre-enrichment step is performed. During the enrichment process, the target cells can repair and grow to a higher level. Secondary enrichment can also be performed to selectively promote the growth of target pathogens and inhibit the background microbial community. Because it is difficult to provide suitable environmental conditions for simultaneous growth, two filters were developed in series to overcome total contaminant removal. However, at lower concentrations of contaminants, the co-oxidation of ammonia, iron, and manganese is feasible.

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