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Opinion Article

Growth and Function of Actinomycetes: A Terrestrial Bacteria

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DESCRIPTION

A class of filamentous unicellular bacteria known as the Actinomycetes produces spores and forms a branching network of filaments. The actinomycetes are a diverse class of gramme-positive bacteria with DNA that is highly concentrated in the bases guanine (G) and cytosine (C). They make up one of the biggest bacterial groups and are found all over terrestrial and aquatic habitats. Particularly the streptomycetes, are soil-dwelling saprophytes, but can also be found in freshwater, saltwater, and the air.

The prokaryotic organisms known as actinomycetes are categorised as bacteria but stand out sufficiently to be examined separately. The entire quantity of actinomycetes is often one to two orders of magnitude lower than the total number of bacteria. They are a crucial part of the bacterial ecosystem, particularly in environments with high pH, high temperatures, or water stress. Morphologically, actinomycetes contain elongated cells that branch into filaments or hyphae that gives them a fungi-like appearance.

Actinomycete hyphae are considerably smaller than fungal hyphae, which allow them to be distinguished from one another. This group of bacteria is notable for its capacity to use a wide range of soil-based substrates, particularly some of the less biodegradable insect and plant polymers like chitin, cellulose, and hemicellulose. Despite being formerly thought of as soil microorganisms, marine actinomycetes are now also acknowledged to be significant. In particular, it has been demonstrated that marine actinomycetes have novel secondary metabolites that provide a fresh perspective on the microbial natural products found in soil actinomycetes.

Actinomycetes create a wide range of natural chemicals useful for agriculture, biotechnology, and medicine, including most of the antibiotics we use in hospitals. Many actinomycetes have evolved to live in symbiosis with organisms including plants, fungus, insects, and sponges rather than as free-living bacteria. These organisms have the common trait of benefiting from the natural products and enzymes produced by actinomycetes, whether it is for growth promotion, pathogen defence, or the breakdown of complex natural polymers like lignocellulose.

Actinomycetes also gain from the resources of the hosts with which they interact. There is mounting evidence that these interactions regulate the activity of biosynthetic gene clusters and have been crucial in the development of the diverse range of chemicals found in actinomycete-produced secondary metabolites. Although several antibiotic biosynthetic gene clusters exhibit low expression under laboratory conditions, they are probably expressed in response to host-specific needs.

Using acidified media with a pH of 5.5, three hundred and fifty one actinomycete isolates were obtained from 21 rhizospheric soil samples. Their antifungal, siderophore-production, and phosphate-solubilizing abilities were estimated.

Grass-positive bacteria with a high GC content that are extensively dispersed in a variety of situations and are found in soil are known as actinomycetes. They have the most biological and commercial value, producing a variety of biologically useful compounds like enzymes, anticancer drugs, and antibiotics. A few actinomycetes, including *Streptomyces acidiphilus* and members of the genus, grow well in neutral or slightly alkaline circumstances, despite the fact that actinomycetes are typically known as neutrophiles. It has been noted that *Streptacidiphilus* needs acidic environments (pH 2.6–5.5) to develop. Acidophilic actinomycetes is the another name for the members of the genera *Actinospica* and *Catenulispora*.

Neutroporphobic acidophiles and strict acidophiles are the two main groups of acidophilic actinomycetes. Acidophiles that are typically neutrotolerant thrive best between pH 5.0 and 5.5 in their media. Members of the strictly acidophilic group normally grow in media with a pH range of 3.5 to 6.5, with pH 4.5 to 7.5 being the ideal growth range. The actinomycetes that are frequently observed in acidic settings are members of the genus *Streptomyces*. Because they produce bioactive compounds or enzymes that hydrolyze fungal cell walls, actinomycetes have been thought of as potential biocontrol agents against a variety of phytopathogenic fungi.

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Actinomycetes have the following functions: They are sources of natural products and medicines like streptomycin. They produce geosmin, a substance that gives water and soil their distinctive earthy smell; are able to break down complex organic molecules; and are capable of biological nitrogen fixation with non-legume-associated *Frankia* species.

CONCLUSION

Due to the lack of efficient antibiotics, the state of global public health is terrible. To address this issue and safeguard the developments in modern medicine that have been made over the past 100 years, coordinated actions must be implemented on a global scale. Actinomycetes, the known source of the majority of contemporary antibiotics, are the focus of current efforts. From a single broth of a single strain, novel chemicals with various skeletons can be discovered. Actinomycetes, particularly rare actinomycetes, will continue to be exploited, leading to the development of the desired novel antibiotics. The alteration of culture medium, which encourages actinomycete strains to create novel compounds, should also be the subject of latest research.