

GENERAL CHARACTERISTICS OF ACTINOMYCETES

The term “Actinomycete” comes from the Greek words “atkis” which means ray, and “mykes” which means fungi.

Actinomycetes are called actinobacteria or high G + C rich Gram-positive filamentous bacteria due to their mycelium like (slender and branched) structures.

Morphology: These filaments are long and it may fragment into much smaller units and less broad than that of the fungal mycelium (usually 0.5 to 2.0 μm in diameter). Due to their rod-shaped arrangement, they are called filamentous bacteria.

A chain of sexual spores called conidia are produced on their hyphae, and few of the actinomycete (genera) found in soil bear the sporangium containing spores. The colonies are powdery mass over the surface of culture media, often these are pigmented when the aerial spores are produced.

They are Gram-positive rod-shaped to filamentous, aerobic and generally non-motile in the vegetative phase.

Habitat: These can be terrestrial or aquatic organisms. Pathogenic-actinomycosis

They are morphologically quite different with each other.

Nutritionally diverse

Aerobic, Facultative anaerobes

Classification: Very diverse with many polyphenetic branchings

Domain: Bacteria
Phylum: Actinomycetota
Class: Actinomycetia
Order: Actinomycetales
Family: Actinomycetaceae

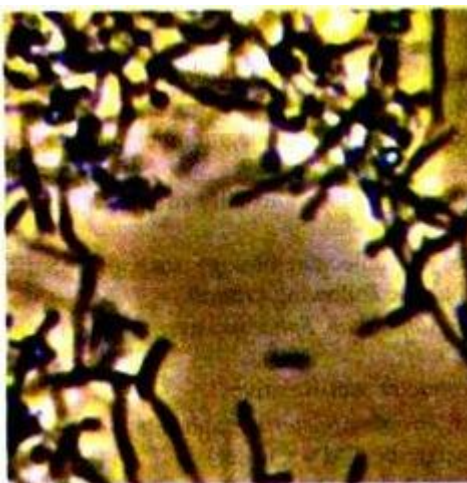
It contains various sub-orders such as Actinomycineae, Corynebacterineae, Catenuispora, and Micrococcineae.

Important Actinomycetes:

1. Actinomyces is anaerobic to facultatively aerobic, filamentous micro-colony
2. Streptomyces has intact and abundant aerial mycelium with long chain spores.
3. Nocardia a common soil organism is an obligate aerobe. Nitrogen-fixing actinomycetes,

Frankia produces true mycelium, and they are microaerophilic and live symbiotically with non-leguminous plants. Frankia, is a plant symbiont that produces root-nodules fixes nitrogen in non-leguminous plants such as *Alnus* (alder), *Ceanothus* (wild lilae) and *Casuarina* (Australian pine or She-wood). It is difficult to cultivate on artificial culture medium. The aerial mycelium develops multicellular sporangium.

4. Arthrobacter, is also a soil-inhabitant. They are coccoid but when growing actively, they form irregular rods. They are Gram-positive but some strains are Gram-negative. Some are motile in nature.



Streptomyces.

Actinomyces is a typical mycelial actinobacteria. They are anaerobic or facultative anaerobic microorganism. They do not produce an aerial mycelium. *A. bovis* grows in oral cavities and can cause serious infection such as lumpy jaw.

Bifidobacterium, is a mycelial form but recently, its phylogeny places it as a similarity to Actinomyces. It is anaerobic, irregular rod-shaped bacteria, found in the intestinal tracts of animal e.g. *B. bifidus*. It also grows in human breast milk which contains amino sugar not found in cow's milk.

Streptomyces, is mycelial forming actinobacteria that lives in soil, produces aerial as well as substrate mycelium. The aerial hyphae differentiate to form asexual conidiospores in chains. They are blue, gray, green, red, violet or yellow colour.

They impart "earthy" odor to soil after rain which is due to the presence of geosmines (volatile organic compound), some important antibiotics namely, streptomycin, chloramphenicol and tetracycline are produced from this genus.

Helicobacteria, is only phototrophic Gram- negative bacteria, required organic carbon sources. They have a unique type of bacteriochlorophyll called bacteriochlorophyll g They are anaerobes carrying out anoxygenic photosynthesis.

Importance

1. Contribution to soil ecology: Useful as they can break down the tough compounds or the polymers that can range from lignocelluloses to the pectin and also the cell walls of fungi. They can recycle the organic material that is present in the soil and can control the growth of other organisms present in the soil.

They can also help to fix the nitrogen content in the soil.

The spores are capable of surviving for a longer period of time. In these conditions, the spores germinate to form germ tubes; these tubes further develop to become mycelium.

2. Thermophilic actinomycetes produce heat thus provides a favorable condition for the decomposition. The spores that are present in the soil are hydrated and thus the motile spores are released.

3. Producers of antibiotics

4. Producers of Volatile Organic Compounds (VOC)- earthy smell of soil

