**Bacterial taxonomy Lec .10 Phylum *Actinobacteria***

**Suborder Corynebacterineae**

**Genus *Mycobacterium***

**Scientific classification**

**Domain Bacteria**

**Phylum Actinobacteria**

**Class Actinobacteria**

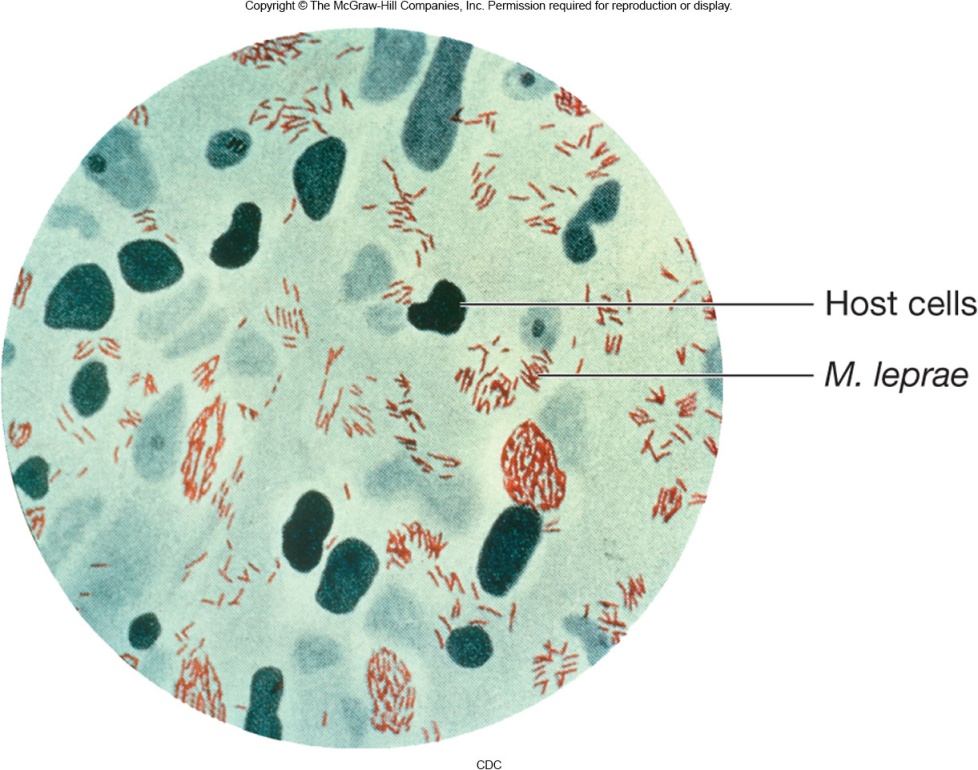
**Order Actinomycetales**

**Family Mycobacteriaceae**

**Genus Mycobacterium**

**Species *M.tuberculosis***

* Straight or slightly curved rods that sometimes branch or form filaments
* Aerobic and catalase positive
* Filaments readily fragment into rods and coccoid bodies
* Very slow growing on culture media.



**Fig.1 Mycobacterium stained with acid fast stain**

**Mycobacterial Cell Walls**

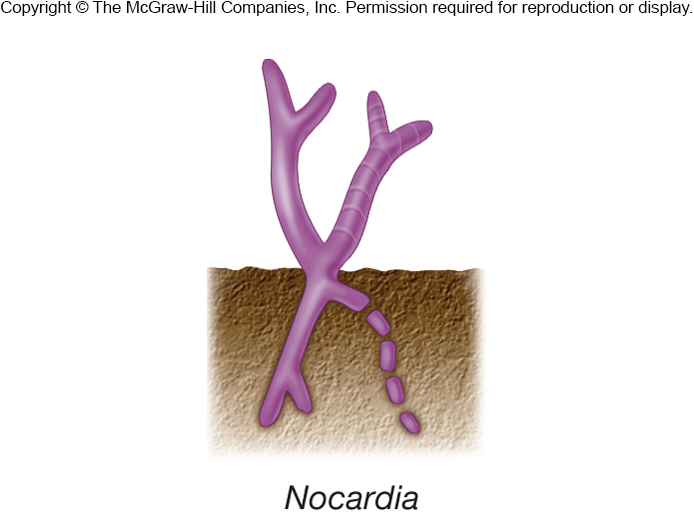
* Contain waxes with 60 to 90 carbon mycolic acids
* Cell wall surface contains the glycolipid trehalose dimycolate
* cell wall very hydrophobic
* impenetrable by antibiotics
* acid-fast
* basic fuchsin dye not removed by acid alcohol treatment.

**Important Species of *Mycobacterium***

* *M. bovis* causes tuberculosis in cattle, humans
* *M. tuberculosis* causes tuberculosis in humans
* *M. avium* complex (MAC) causes various diseases
* *M. leprae* causes Leprosy.

**Genus Nocardia**

* Along with genus *Rhodococcus* make up the family *Nocardiaceae*.
* Develop a substrate mycelium that readily breaks into rods and coccoid elements.
* Some also form an aerial mycelium and conidia(fig.2).

Figure.2 Nocardia 

**Impact of *Nocardia***

* Most are free-living saprophytes.
* Can degrade many molecules.
* e.g., petroleum hydrocarbons, detergents, benzene
* Involved in biodegradation of rubber joints in water and sewage pipes.
* Some are opportunistic pathogens causing nocardiosis
* usually infect lungs; can infect central nervous system

**Suborder *Micromonosporineae***

* Only one family, *Micromonosporaceae*
* extensive substrate mycelia
* lack or have rudimentary aerial mycelia
* sporangiospores motile or nonmotile
* found in soil and aquatic habitats (especially freshwater).

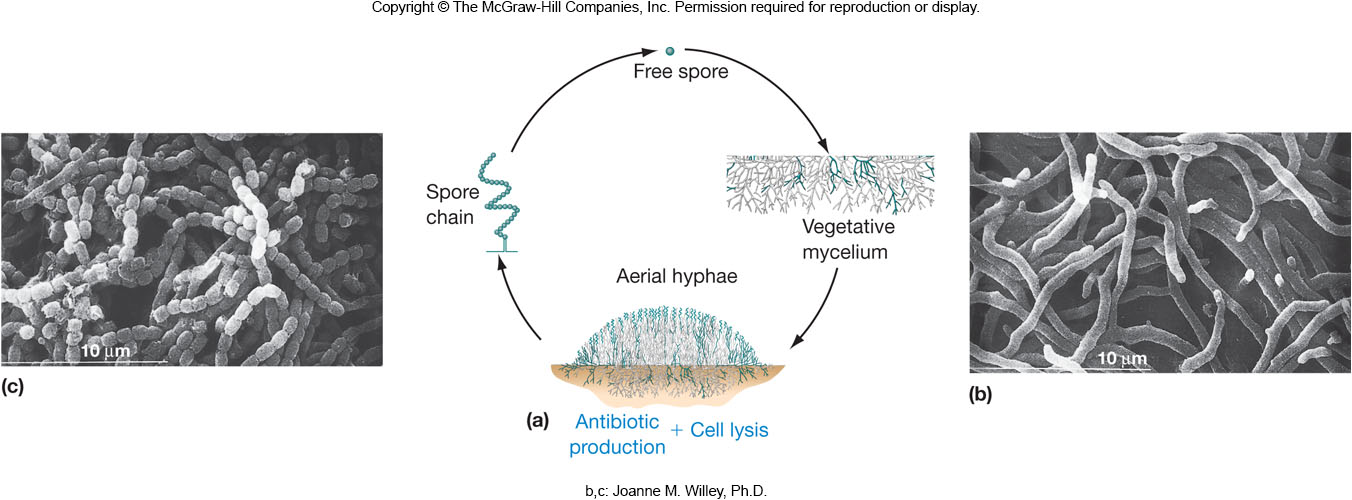
**Genus *Propionibacterium***

* Found on skin and in digestive tract of animals
* also in dairy products such as cheese
* used in production of Swiss cheese

Most important genus *P. acne* which involved in development of body odor and acne vulgaris.

**Suborder *Streptomycineae***

* One family, three genera
* Aerial hyphae that divide in single plane to form chains of 3–50 nonmotile spores
* All have type I cell wall
* G+C DNA content is 69–78%
* Filaments grow by tip extension (fig.3).



**Figure .3 Life cycle and cell morphology of *Streptomycineae***

**Genus *Streptomyces***

**Scientific classification**

**Domain Bacteria**

**Phylum Actinobacteria**

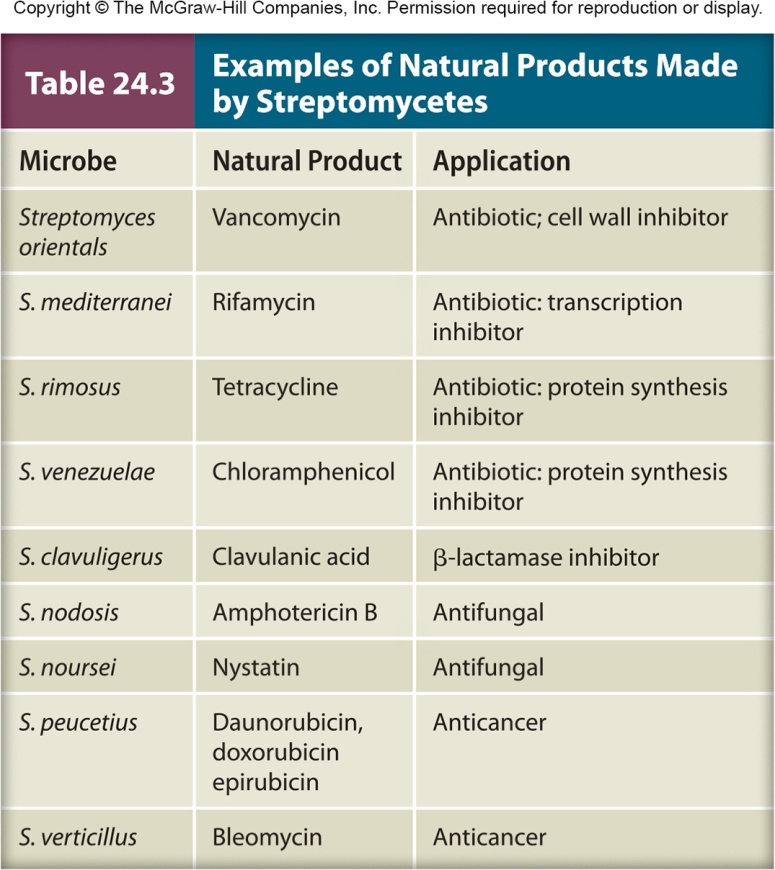
**Class Actinobacteria**

**Order Actinomycetales**

**Family Streptomycetaceae**

**Genus Streptomyces**

* Are 1 to 20% of culturable soil microbiota.
* Produce geosmin.
* volatile substance that is source of moist earth odor
* Important in mineralization process.
* Aerobically degrade many resistant substances (e.g., pectin, lignin, and chitin).
* Produce vast array of antibiotics, other bioactive compounds, and antibiotic resistance genes.
* Most are nonpathogenic saprophytes.

Table 1 Some products of Streptomycetes

**Pathogenic Streptomycetes**

* usually infect lungs as well as can infect central nervous system.
* *Streptomyces somaliensis causes* actinomycetoma infection of subcutaneous tissues in humans leads to swelling, abscesses, and bone destruction.

**Order *Bifidobacteriales***

One family and ten genera

Most important genera are; *Gardnerella* which found in human genitourinary tract *and* thought to be major cause of vaginitis and *Bifidobacterium* nonsporing rods that found in mouth and intestinal tract of warm-blooded animals, in sewage, and in insects.

***Bifidobacterium bifidus***

**Scientific classification**

**Domain Bacteria**

**Phylum Actinobacteria**

**Class Actinobacteria**

**Order Bifidobacteriales**

**Family Bifidobacteriaceae**

**Genus Bifidobacterium**

**Species *B.bifidum***

* Pioneer colonizer of human intestinal tract
* Does not appear to be major cause of disease
* Probiotic agent.