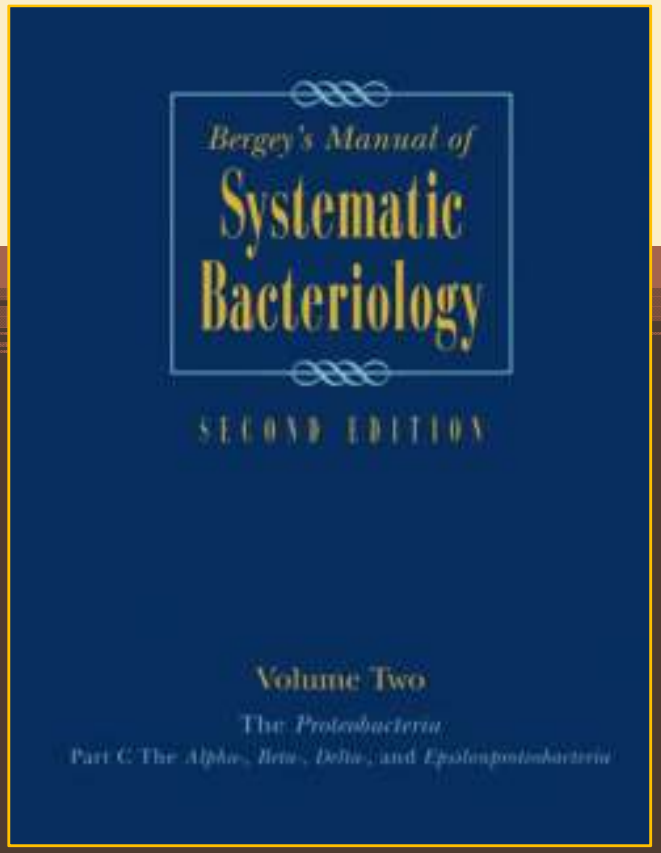
Bacterial Classification

By
PRAMOD KUMAR MAHISH
Asst. Professor (Biotechnology)
Govt. Digvijay PG College
Rajnandgaon (C.G.)



Bergey's Manual of Systematic Bacteriology
1st Edition

John G. Holt, Editor-in-Chief
Williams & Wilkins, Baltimore, MD

Published in 4 volumes:

Volume 1 (1984)
Gram-negative *Bacteria* of general, medical, or industrial importance
ISBN 0-683-04108-8
Volume 2 (1986)
Gram-positive *Bacteria* other than *Actinomycetes*
ISBN 0-683-07893-3
Volume 3 (1989)
Archaeobacteria, *Cyanobacteria*, and remaining Gram-negative *Bacteria*
ISBN 0-683-07908-5
Volume 4 (1989)
Actinomycetes
ISBN 0-683-09061-5

Vol. 1 (Section 1-11)
Gram Negative Bacteria

- Section 1 (The Spirochetes)
  - Family - Spirochetaceae
  - Example- *Spirochaeta*
- Section 4 (Aerobic, Rods and Cocci)
  - Family - Psedomonaceae
  - *Pseudomonas*
  - Family - Azotobacteriaceae
  - *Azotobactor*
  - Family – Methylococcaceae
  - *Methylococcus*

Spirochetes

- Both syphilis and Lyme disease are caused by these bacteria, and other species are important symbionts in the stomachs of cows and other ruminants.
- Spirochaetes are distinguished from other bacterial phyla by the location of their flagella, sometimes called axial filaments,

Pseudomonas

- Pseudomonas is a genus of Gram-negative aerobic bacteria, belonging to the family Pseudomonadaceae containing 191 validly described species.
- Bioremediation agent
- Food spoilage agent.

Azotobacter

- They are aerobic, free-living soil microbes which play an important role in the nitrogen cycle in nature, binding atmospheric nitrogen, which is inaccessible to plants, and releasing it in the form of ammonium ions into the soil.
- Apart from being a model organism, it is used by humans for the production of biofertilizers, food additives and some biopolymers.

Methylococcus

- Methylococcus capsulatus is an methanotrophic gram-negative, non-motile coccoid bacterium.
- In addition to methane, M. capsulatus is able to oxidize some organic hydrogen containing compounds such as methanol.
- M. capsulatus has also been demonstrated to be thermotolerant- that is, it can grow well up to 50°C, though its optimum growth temperature is 37°C.

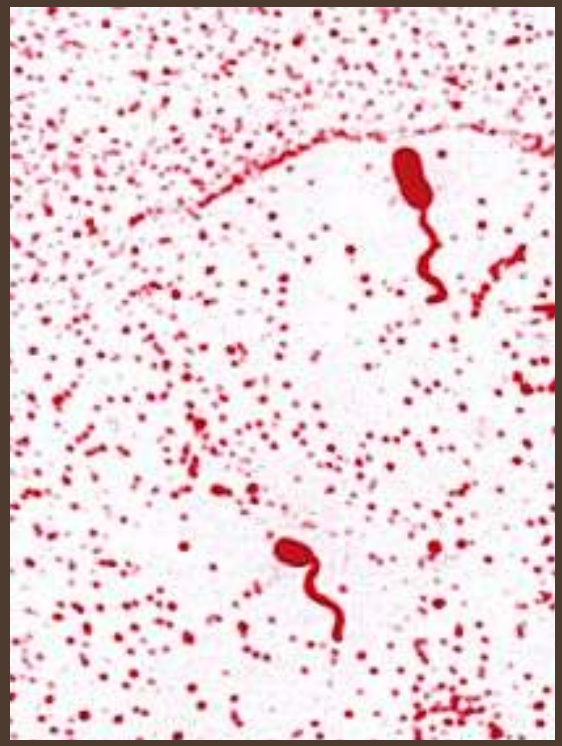
- Section 5 (Anaerobic Rods)
  - Family – Enterobacteriaceae
  - *Escherichia*
  - Family – Vibrionaceae
  - *Vibrio*
- Section 9 (Rickettsias & Chlamydias)
  - Family – Rickettsiaceae
  - *Rickettsia*
- Section 10 (Mycoplasm)
  - Family – Mycoplasmataceae
  - *Mycoplasm*

Escherichia

- Escherichia is a genus of Gram-negative, non spore forming, facultatively anaerobic, rod-shaped bacteria from the family Enterobacteriaceae.
- Escherichia are harmless but particular strains of some species are human pathogens, and are known as the most common cause of urinary tract infections, significant sources of gastrointestinal disease, ranging from simple diarrhea to dysentery-like conditions, as well as a wide range of other pathogenic states.
- While E. coli is responsible for the vast majority of Escherichia-related pathogenesis, other members of the genus have also been implicated in human disease

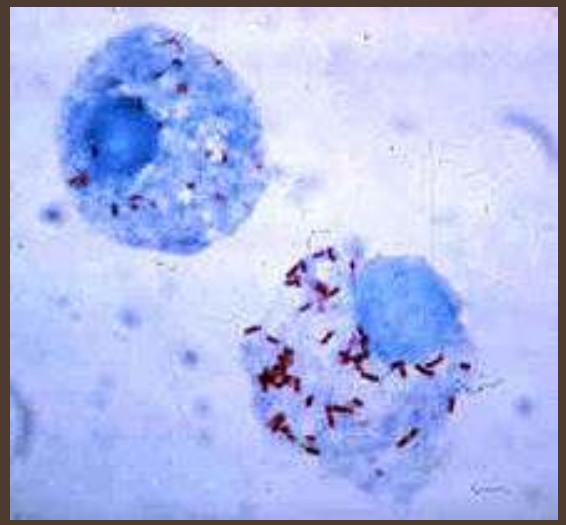
Vibrio

- Vibrio is a genus of Gram-negative bacteria possessing a curved rod shape (comma shape),several species of which can cause foodborne infection, usually associated with eating undercooked seafood.
- Typically found in saltwater, Vibrio spp. are facultative anaerobes that test positive foroxidase and do not form spores.
- All members of the genus are motile and have polar flagella with sheaths



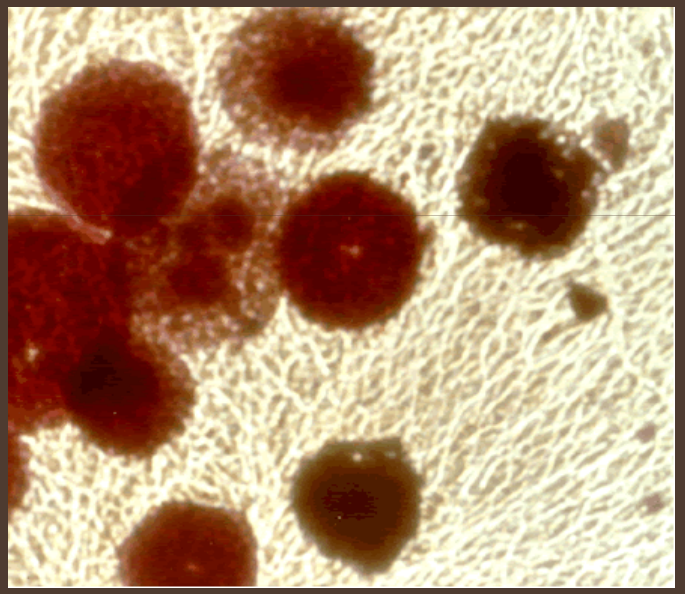
Rickettsia

- Rickettsia is a genus of non-motile, Gram-negative, non-sporeforming
- Rickettsia species are carried by many chiggers, ticks, fleas, and lice, and cause diseases in humans such as typhus, rickettsialpox, Boutonneuse fever, African tick bite fever, Rocky Mountain spotted fever, They have also been associated with a range of plant diseases. The name rickettsia is often used for any member of the Rickettsiales.



Mycoplasma

- Mycoplasma refers to a genus of bacteria that lack a cell wall.Without a cell wall, they are unaffected by many common antibiotics
- Several species are pathogenic in humans, including M. pneumoniae, which is an important cause of atypical pneumonia and other respiratory disorders, and M. genitalium, which is believed to be involved in pelvic inflammatory diseases. Mycoplasma are the smallest living cells yet discovered



Vol. II (Section 12-17)
Gram Positive Bacteria

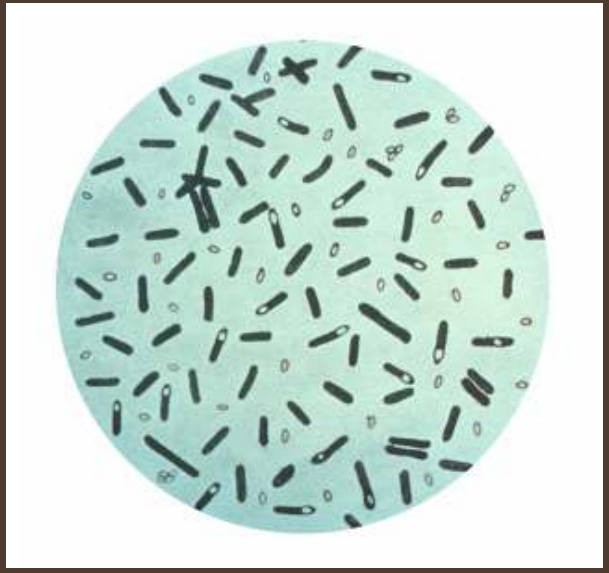
- Section 13 (Endospore forming Rods, Cocci)
  - Example- *Bacillus, Clostridium*

- Section 15 (Non sporulating, Irregular)
- *Corynebacterium*

- Section 16 (Mycobacteria)
  - Family – Mycobacteriaceae
  - *Mycobacterium*

Clostridium

- C. botulinum, an organism that produces botulinum toxin in food/wound and can cause botulism
- C. tetani, the causative organism of tetanus
- C. thermocellum can utilize lignocellulosic waste and generate ethanol, thus making it a possible candidate for use in production of ethanol fuel

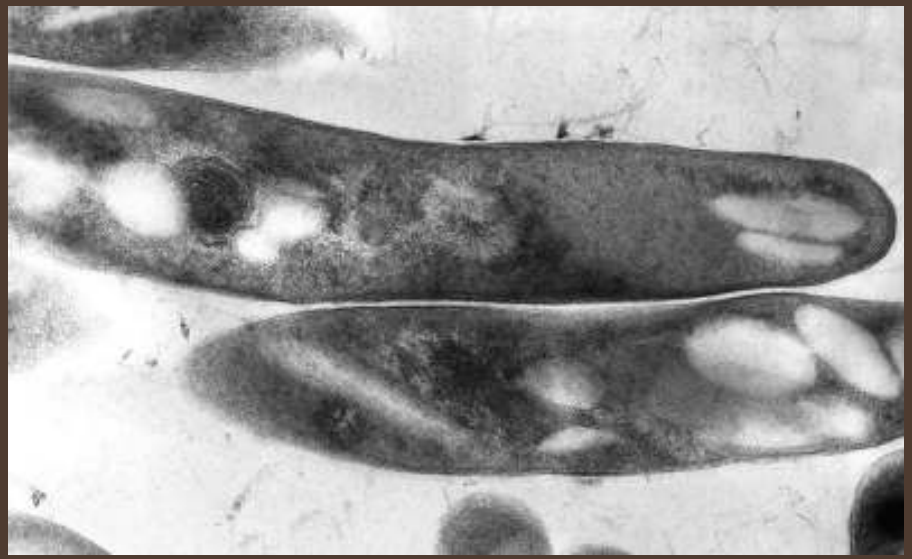


Corynebacterium

- Corynebacterium is a genus of Gram-positive, rod-shaped bacteria. They are widely distributed in nature and are mostly innocuous.
- Some are useful in industrial settings such as C. glutamicum. Others can cause human disease.
- C. diphtheriae, for example, is the pathogen responsible for diphtheria.

Mycobacterium

- The genus includes pathogens known to cause serious diseases in mammals, including tuberculosis (Mycobacteriu m tuberculosis)
and leprosy (Mycobacterium leprae)

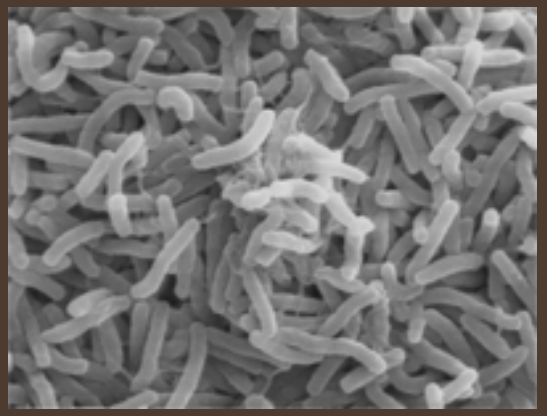


Vol. III (Section 18-25) Archeobacteria

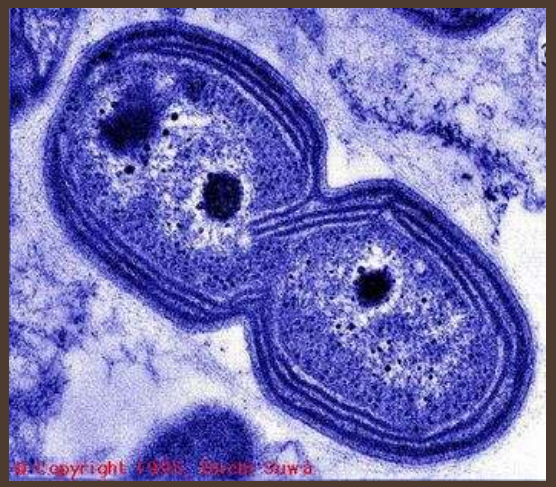
- Section 20 (Nitrifying Bacteria)
  - Family - Nitrobacteraceae
  - Example- *Nitrobactor, Nitrosomonas*
- Section 25 (Methanogenic)
  - *Methanobacterium*
  - *Methanococcus*

Nitrobacter

- Nitrobacter is a genus of mostly rod-shaped, gram-negative
- Nitrobacter plays an important role in the nitrogen cycle by oxidizing nitrite into nitrate in soil.



- Nitrosomonas bacteria first convert ammonia into nitrites. Nitrobacter convert the nitrites into nitrates, which are readily absorbed by the plants.

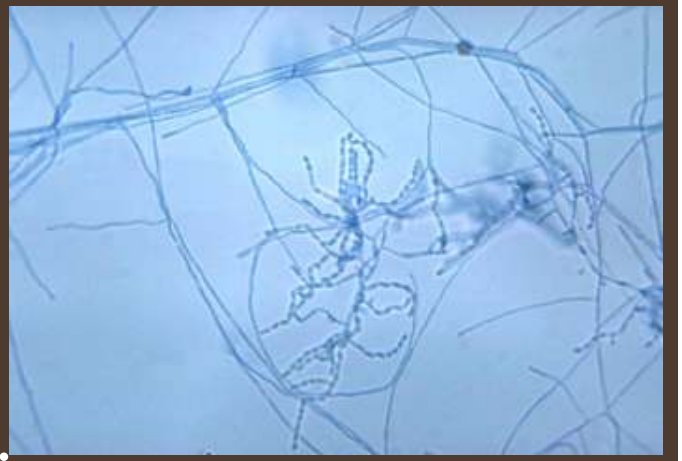


Vol. IV (Section 26-33) Actinomycetes

- Section 26 (Nocardia actinomycetes)
  - Example- *Nocardia*
- Section 27 (Actinomycetes)
  - *Frankia*

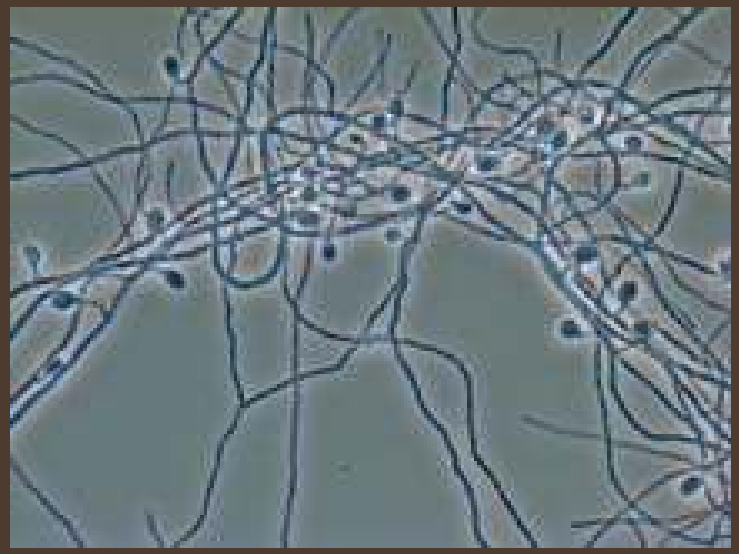
Nocardia

- Nocardia is a genus of weakly staining Gram-positive, catalase-positive, rod-shaped bacteria. It forms partially acid-fast beaded branching filaments (acting as fungi, but being truly bacteria).
- It has a total of 85 species. Some species are non-pathogenic while others are responsible form cardiosis. Nocardia are found worldwide in soil that is rich with organic matter.



Frankia

- Frankia is a genus of nitrogen fixing, filamentous bacteria that live in symbiosis with actinorhizal plants, similar to the Rhizobia bacteria that are found in the root nodules of legumes in the Fabaceae family.
- Bacteria of this genus also form root nodules.



Bergey's Manual of Systematic Bacteriology
2nd Edition

Published by Springer, New York

The second edition is being published in 5 volumes - please click on the Volume links below for further details or to purchase the volume.

Volume 1 (2001)
The *Archaea* and the deeply branching and phototrophic *Bacteria*
Editor-in-Chief: George M. Garrity
Editors: David R. Boone and Richard W. Castenholz
ISBN 0-387-98771-1

Volume 2 (2005)
The *Proteobacteria*
Editor-in-Chief: George M. Garrity
Editors: Don J. Brenner, Noel R. Krieg and James T. Staley
ISBN 0-387-95040-0

Volume 3 (2009)
The *Firmicutes*
Editors: Paul De Vos, George Garrity, Dorothy Jones, Noel R. Krieg, Wolfgang Ludwig, Fred A. Rainey, Karl-Heinz Schleifer and William B. Whitman
ISBN 0-387-95041-9

Volume 4 (2011)
The *Bacteroidetes*, *Spirochaetes*, *Tenericutes* (*Mollicutes*), *Acidobacteria*, *Fibrobacteres*, *Fusobacteria*, *Dictyoglomi*, *Gemmatimonadetes*, *Lentisphaerae*, *Verrucomicrobia*, *Chlamydiae*, and *Planctomycetes*
Editors: Noel R. Krieg, James T. Staley, Daniel R. Brown, Brian P. Hedlund, Bruce J. Paster, Naomi L. Ward, Wolfgang Ludwig and William B. Whitman
ISBN 0-387-95042-6

Volume 5 (2012)
The *Actinobacteria*
Editors: Michael Goodfellow, Peter Kämpfer, Hans-Jürgen Busse, Martha E. Trujillo, Ken-ichiro Suzuki, Wolfgang Ludwig and William B. Whitman
ISBN 0-387-95042-7

Thankyou