KINGDOM MONERA

INTRODUCTION:

- **Copeland (1956)** established **kingdom monera** in which **all prokaryotes** were included.

General Characters:

(i) It involves unicellular / conlonial / multicellular with prokaryotic organisms. **e.g. Archaebacteria, Bacteria, Actinomycetes, Mycoplasma, Rickettsiae, Spirochaetes, Chlamydiae, Cyanobacteria**.

(ii) **Cell wall** is composed of **peptidoglycan** except archaebacteria and absent in mycoplasma.

(iii) **Genetic material** is **double stranded, circular DNA** supercoiled with help of non-histone proteins. Nuclear membrane & nucleus are absent.

(iv) All membrane bound organelles are absent thus they bear **one envelope system**.

(v) If Photosynthetic pigments present, they are distributed in thylakoid membranes or chromatophores.

(vi) **70 S type of Ribosomes** are present.

(vii) Respiratory enzymes are associated with plasma membrane.

(viii) Nutrition is autotrophic/heterotrophic.

(ix) **Cyclosis (streaming movement of cytoplasm) is absent in monerans.**

(x) Reproduction takes place by asexual methods only.

(xi) Mitosis, meiosis, sexual reproduction are absent.

(I) Archaebacteria:

- Archaebacteria are **most primitive form of life** that are found in most extreme environmental conditions like high salt concentration, high temperature etc. These are oldest of the **'living fossils'**.
- They show following features.

(i) The **cell wall** of archaebacteria is composed of **noncellulosic polysaccharides or pseudomurein or glycoproteins / proteins**.

- **Peptidoglycan and muramic acid** are absent in cell wall.

(ii) Plasma membrane has **long chain branched lipids (phytanols** - glycerol ether lipids**)**. The latter **decrease membrane fluidity** and help **to increase tolerance against extremes of heat, low pH.**

(iii) Their 16 S rRNA genes are different from that of eubacteria.

Types of Archaebacteria:

These are of three types

(i) Methanogens **(ii) Halophiles** **(iii) Thermoacidophiles**

(i) Methanogens:

- They are **obligate anaerobes** found in marshy habitats, swamps, ruminants, sewage treatment plants.
- Cell wall of these bacteria possesses protein **(e.g.** *Methanogenium***)** or noncellulosic polysaccharides **(e.g.** *Methanosarcina***)** or **Pseudomurein** (**e.g.** *Methanobacterium***)**.

It contains **N-acetly talosaminuronic acids instead of NAM**.

- **Methanogens are present in the guts of several ruminant animals such as cows and buffaloes and they are responsible for the production of methane (biogas) from the dung of these animals. (AIPMT 2015)**

(ii) Halophiles:

- They are **Facultative anaerobes**, found in salt lakes, dead sea, industrial plants that form salt by solar evaporation of sea water and salted proteinaceous materials like salted fish, salted hides. They require17–23% NaCl for better growth.
- They have reddish pigment **bacteriorhodopsin** in their membrane to trap sun light and form **ATP** directly. But this ATP is not used for the synthesis of food.
- They survive in **salty water** due to **presence of branched chain lipids in their cell mambrane**, absence of sap vacuoles & maintenance of high osmotic concentration. **e.g.** ***Halobacterium, Halococcus***.

(iii) Thermoacidophiles:

- They are **facultative anaerobe**, found in hot water springs at temperature as high as **80ºC** and **pH as low as 2.** They tolerate high temperature due to **homopolar bonds in their proteins**. They oxidize sulphur to H_2SO_4 under aerobic conditions and pH 2. This acid makes medium acidic. Sulphur is reduced to H_2S in anaerobic conditions. **e.g.** *Thermoplasma, Sulfolobus.*

Note – All Archaebacteria are Gram negative organisms.

(II) Eubacteria:

- Bacteria are smallest, microscopic, unicellular, most primitive prokaryotic microorganisms.

History:

- **Bacteria** were first **discovered** by **Anton van Leeuwanhoek** in 1676 in **stored rain water** and in **scum** (tartar) scrapped from teeth & used the term **'little animalcules'** for them. He was considered as discoverer of the **microbial world / wonder world** of microbes and used the term **'dierkens'**.
- **Ehrenberg (1838)** coined the **term bacteria**.
- **Louis pasteur (father of modern microbiology)** worked on **fermentation** and reported that it takes place by bacteria. He used the term microorganism. He discovered antirabies vaccine and bacteria causing chicken cholera.
- **Robert Koch** gave a set of rules, known as **Koch's Postulates**. He proved **"The Germ Theory of Disease".**

Habitat:

They show cosmopolitan distribution. They are found in everywhere-air, water, soil, in plants and animals.

Forms of Bacteria:

Size:

- The average size of **length is 0.5–10μm and width 0.5–2 μm**.

Shape :

On the basis of shape, **Cohn (1972)** recognised 4 basic forms of Eubacteria.

(i) Coccus (Pl. Cocci): These are always nomotile / nonflagellated. Spherical or oval shaped.

Coccus bacteria can be found in Monococcus, Diplococcus, Streptococcus (chain), Staphylococcus (cluster) and Sarcinae (8-64 cocci).

(ii) Bacillus (Pl. Bacilli): Rod shaped with blunt ends and motile/nonmotile. **It is most common shape.**

(iii) Spiral (Pl. Spirilla): They are elongated, spiral shaped, flagellated and cork screw like. **e.g.** *Spirillum volutans.*

(iv) Vibrium (Pl. Vibrio): It looks like sign of comma (**,**) and slightly curved rod of less than half turn **e.g.** *Vibrio cholerae*.

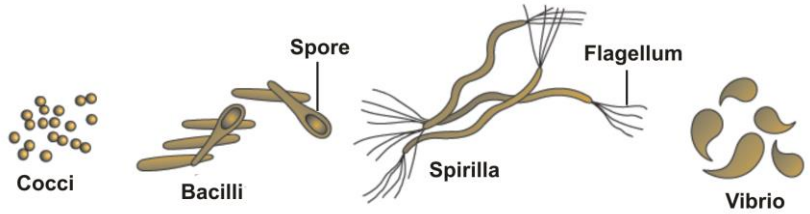

Figure - Bacteria of different shapes (TEXT BOOK)

Resonate the Concept

Other shapes of bacteria are as follows –

(i) Pleomorphic: Bacterium is found in more than one form **e.g.** *Azotobacter, Rhizobium*.

(ii) Stalked bacterium: Bacterium has a stalk **e.g.** *Caulobacter***.**

(iii) Budded bacteria: Its body is swollen at places **e.g.** *Rhodomicrobium***.**

(iv) Mycelial bacteria: They bear aseptate branched filamentous body like a fungal mycelium **e.g.** *Beggiatoa, Actinomycetes*.

Flagellation: The arrangement of flagella on the cell of bacteria is called flagellation.

On the basis of flagellation, bacteria are classified into following forms.

(a) Atrichous: Flagella is absent. **e.g.** *Pasteurella.*

(b) Monotrichous: Single flagellum is found near one end of bacterium **e.g.** *Vibrio, Thiobacillus***.**

(c) Cephalotrichous: A group or tuft of flagella occurs at one end. **e.g.** *Pseudomonas fluorescens*.

(d) Amphitrichous: A Flagellum at each of the two ends. **e.g.** *Nitrosomonas*.

(e) Lophotrichous: A tuft or group of flagella ocurs at each of the two ends. **e.g.** *Spirillum volutans*.

(f) Peritrichous: Number of flagella are uniformly distributed all over the surface. **e.g.** *Clostridium tetani, E.coli***.**

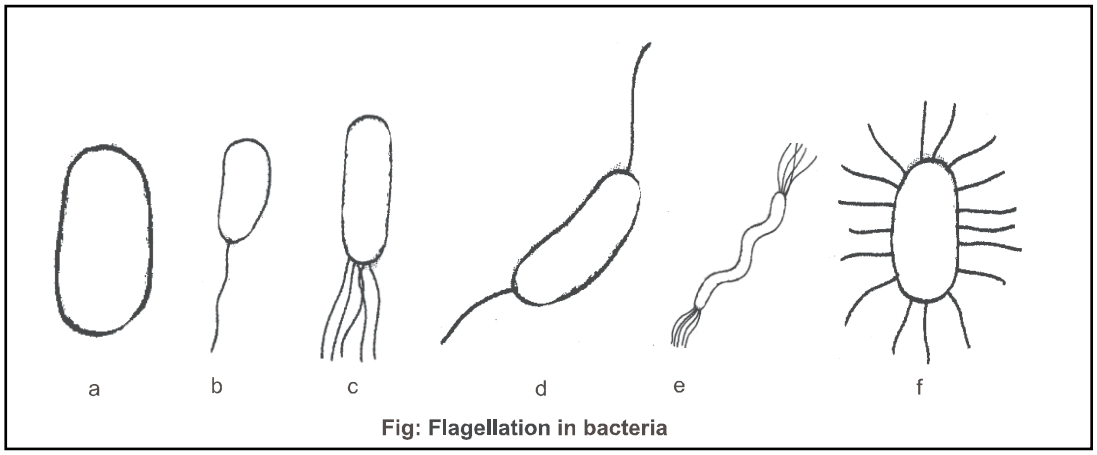

Fig: Flagellation in bacteria

Gram Staining Technique:

- **Hans Christian Gram** developed this technique to stain bacteria.

Steps of gram staining technique:

Bacteria are firstly stained by weak alkaline solution of **crystal violet** (Gram stain).

↓

All the bacteria become purple coloured.

↓

Bacteria are treated with 0.5% iodine solution (fixative).

↓

Washed with water and then absolute alcohol or acetone (decoloriser).

↓

Bacteria that retain blue or purple colour are called Gram +ve bacteria **e.g.** *Bacillus subtilis*.

Bacteria that become colourless are called Gram -ve bacteria. **e.g.** *E.coli*.

↓

Further stained with saffrenin (Red colour)

Differences between Gram Positive and Gram Negative Bacteria

S. No.	Gram Positive Bacteria	Gram Negative Bacteria
1	Cell wall is single layered.	Cell wall consists of two layers outer wall is of lipopolysaccharide and inner of peptidoglycan.
2	Murein or mucopeptide is 70-80% in cell wall.	It is 10-20%.
3	The diameter of cell wall is 15-20nm and some time upto 80 nm.	It is 8-12 nm.
4	Lipid contents are 2-4% in cell wall.	Lipid contents are 20-30% in cell wall.
5	Teichoic acids are present in wall.	Teichoic acids are absent in wall.
6	Basal body of the flagellum contains two rings of swellings.	Four rings of swellings occurs in the basal body.
7	Porins are absent.	Hydrophilic channels or porins are found in outer layer of cell wall.
8	These are more susceptible to antibiotics.	They show more resistance to anitibiotics.
9	Diaminopimelic acid (DAP) absent.	DAP present.
10	Capsule is mostly absent.	Capsule is usually present.
11	Mesosome is quite common.	Mesosome is less common.
12	They mainly form exotoxins.	They mainly form endotoxins.

Nutrition in bacteria:

- Bacteria show the most extensive metabolic diversity among all living organisms.
- Most of bacteria are heterotrops and majority of them are decomposer and some of them are parasitic.

Type of nutrition:

1. **Autotrophic bacteria:** These bacteria synthesize their own food by using light (Photoautotrophs) or chemical energy (Chemoautotrophs)
   a. **Photoautrophs:**
      - They perform photosynthesis (non-oxygenic)
      - Photosynthetic pigment are present in cytoplasm (Chromatophore).
      - Hydrogen donor for photosynthesis are generally are inorganic compounds like H_2S, Thiosulphate and some organic compounds.

      e.g. Purple sulphur bacteria (Chromatium).
      Green sulphur bacteria (Chlorobium, Thiothrix).
      Purple non-sulphur bacteria (Rhodospirillium and Rhodopseudomonas).
   b. **Chemoautotrophs:**
      - Photosynthetic pigments are absent.
      - They oxidise chemical (Specially inorganic substance) and released energy is used in chemosynthesis of food.

      e.g. Iron bacteria (Ferobacillus)
      Methane bacteria (Methanomonas)
      Sulphur bacteria (Thiobacillus)
      Nitrifying bacteria (Nitrosomonas, Nitrobacter, Nitrococcus, Azotobacter)
2. **Heterotrophic bacteria:** These bacteria do not synthesise their own food and depend on other organism (Parasitic / Symbiotic) or dead and decay material (Saprophyte) for food.
   a. **Parasitic:** e.g. Mycobacterium, clostridium.
   b. **Symbiotic** e.g. Rhizobium (symbiont with leguminous plants)
   c. **Saprophytic:** e.g. bacillus vulgaris, Clostridium botulinum, Pseudomonas, lactobacillus.

Bacterial respiration:

On the basis of respiration, pasteur classified bacteria in to aerobic and anaerobic forms. Each of them is of two types.

(i) Obligate anaerobes: They live in the absence of O_2. If oxygen is given to them, they die **e.g. *Clostridium botulinum*.**

(ii) Facultative anaerobes: They respire aerobically but can live anaerobically also **e.g. *Aerobacter, Pseudomonas*, *Acetobacter aceti, Clostridium.***

(iii) Obligate aerobes: They grow in oxygen rich environment only. They die in the absence of oxygen **e.g. *Azotobacter, Bacillus subtilis***.

(iv) Facultative aerobes: They are anaerobic bacteria but they can live in the presence of oxygen **e.g. *chlorobium***, lactobacillus.

Reproduction: Bacteria perform reproduction by following methods.

(i) By Binary Fission:

- It takes place during favourable conditions. The transverse binary fission is quite common in which nucleoid divides amitotically without spindle formation. Replication of DNA is bidirectional in entire genome resulting two circular **θ (theta) shaped chromosomes are formed (Theta model of replication of Cairns).**

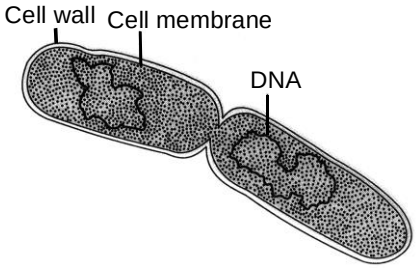

Fig : Dividing Bacterium

(ii) By endospore:

- It takes place in adverse conditions. Endospore is thick walled highly refractile resistant spore and surrounded by four layers.
- The central core of endospore bears cytoplasm. The cortex and cytoplasm has **anticoagulant dipicolinic acid (DPA) and calcium** in the form of **calcium dipicolinate**. Both of them **make** endospore **highly temperature resistant**.
- Endospore acts as perennating body during adverse conditions rather than a reproductive structure.
- Endospores are found in Bacillus bacteria like Bacillus & Clostridium.

(iii) Genetic Recombination / Parasexuality:

- True sexual repoduction is absent. Genetic recombination takes place without formation of gametes, their fusion and meiosis that is called **parasexuality**. The former occurs by three methods.

(1) Transformation:

- It was discovered by **Griffith in** *Diplococcus pneumoniae* **(it causes pneumonia)**. In this method, a piece of DNA of donor cell is obtained by living mature recipient cell in the surrounding medium after death/decay of the donor cell without involving any vector. It does not involve any contact/ conjugation of two bacterial cells.

(2) Transduction:

- It was discovered by **Lederberg and Zinder (1952) in** *Salmonella typhimurium*.
- It is a transfer of DNA / genes from donor bacterium to recipient by bacteriophages. It occur by two methods.
  - **(i) General transduction :** Any gene of the donor bacterium can transfer by bacteriophage during this proccess. **e.g. T_4 – Bacteriophage**.
  - **(ii) Restricted or Specialized transduction:** In this process, bacteriophage is able to transfer only one or few genes of the donor bacterium as non-virulent or temperate phase to recipient **e.g.** *Lambda bacteriophage*.

(3) Conjugation:

- It was first reported by **Lederberg and Tatum in K_{12} strain of** *E.coli*.
- It is a incomplete one way transfer of DNA of donor cell **(Exogenote)** to the recipient cell **(endogenote)** by conjugation tube. The donor cell as plasmid with fertility (F) factor and sex pili while recipient lacks F factor. The F factor determines the formation of sex pili in donor cells.
- If the F factor is free in the cytoplasm, the donor cell is called F^+ strain. If it is attached to nucleoid, the donor bacterial cell is called **Hfr (high frequency of recombination) strain** or super male or metamale or fertile male. The bacterial cell without F factor is called F^-strain. **The frequency of formation of recombinants in $F^+ \times F^-$ is low (1 : 10000–1 : 100000) and the frequency of recombination is very high in Hfr $\times F^-$ conjugation (1 : 100).**

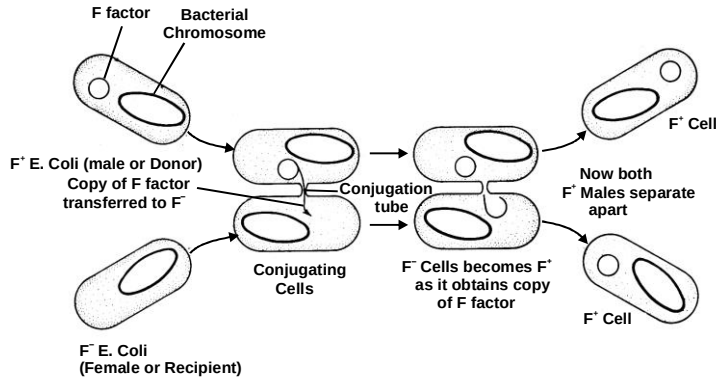

Fig:- Bacterial cells: Reproduction through conjugation

Economic importance of bacteria:

(A) Useful Activities:

(1) Saprophytic bacteria: These are **major decomposers or mineralizers** of earth for regulating biogeochemical cycles.

(2) Ammonifying bacteria: They convert nitrogeneous compounds / proteins of dead plants and animals or their excretory products into ammonia **e.g.** *Bacillus ramosus, B. mycoides, B. vulgaricus*.

(3) Nitrifying bacteria: They convert ammonia into nitrates.

(i) $2NH_3 + 3O_2 \xrightarrow{\textit{Nitrosococcus, Nitrosomonas}} 2NO_2^- + 2H^+ + 2H_2O + \text{energy}$

(ii) $2NO_2^- + O_2 \xrightarrow{\text{Nitrobacter}} 2NO_3^- + \text{Energy}$

Resonate the Concept

- Chemosynthetic autotrophic bacteria (Ammonifying bacteria, Nitrifying bacteria) oxidise various inorganic substances such as nitrates, nitrites and ammonia and use the released energy for their ATP production. They play a great role in recycling nutrients like nitrogen, phosphorous, iron and sulphur.

(4) Symbiotic nitrogen fixers: e.g. *Rhizobium* in root nodules of leguminous plants; *Frankia* in root nodules of *Casuarina, Alnus*; *Xanthomonas* in leaf of *Ardisia* and *Pavatta*.

(5) Retting of fibres: Some bacteria dissolve **pectin of middle lamella** to separate individual fibres in flax, jute, hemp **e.g. *Clostridium perfringens, Pseudomonas fluorescence***.

(6) Vinegar: e.g. *Acetobacter aceti, A. schizenbachi*.

(7) Single cell protein (SCP): Dried biomass of microorganism obtained after culturing, harvesting and drying is called SCP. The SCP is used as protein source in animal feeds and food supplement of man. **e.g. *Methylophilus methylotropus, Rhodopseudomonas capsulata*.**

(8) Curing of Leaves: ***Bacillus megatherium*** is used for **curing of tobacco leaves** while ***Micrococcus candisans*** is used for **curing of tea leaves**.

(9) Production of Lactic acid : It is performed by the acitvity of ***Lactobacillus bulgaricus* and *L. delbrueckii***.

(10) Antibiotics: Many types of antibiotics are obtained by eubacteria and actinomycetes.

S.No.	Antibiotics	Source (Name of bacteria)
1	Streptomycin	*Streptomyces griseus*
2	Neomycin	*Streptomyces fradiae*
3	Chloramphenicol/chlormycetin	*Streptomyces venezuelae*
4	Subtilin	*Bacillus subtilis*
5	Bacitracin	*Bacillus licheniformis*

Resonate the Concept

- First antibiotic Penicillin, was discovered by Alexender Fleming from a fungus *Penicillium notatum*.
- Today on large scale Penicillin is obtained from *Penicillium crysogenum*.

(11) Decomposition of petroleum/hydrocarbons: Genetically engineered superbug (*Pseudomonas putida*) is used to clear hydrocarbons during oil spillage in oceans. The former developed by **Anand Mohan Chakravorty**.

(12) Vitamins : Clostridium butylicum is used to prepare **Riboflavin** similarly **Cobalamin (B_{12})** is formed **by Bacillus megatherium**.

(13) Enzymes : Many enzymes are extracted commercially by bacterial activities **e.g. *Streptokinase* from *Streptococcus pyrogens*, Protease from *Bacillus subtilis*, *Pectinase* from *Clostridium perfringens***.

Harmful Activities:

(i) Food poisoning: It occurs due to toxins produced by some bacteria **(e.g. Clostridium botulinum, Streptococcus)** in food. The eating of such toxic food may cause severe problems.

(ii) Spoilage of food: Spoilage of curd by *Clostridium*, spoilage of milk/milk products by *Lactobacillus*, spoilage of protein rich food by *Pseudomonas*, meat by *Salmonella* and *Lactobacillus*, rotting of egg by *Proteus*, *Pseudomonas, Leuconostoc*, souring of wine by *Acetobacter aceti*.

(iii) Denitrification: Some bacteria convert nitrates and ammonia into nitrogen **e.g. T*hiobacillus denitrificans*, *Pseudomonas denitrificans*.**

Bacterial diseases in human		
S.No.	**Disease**	**Bacteria**
1	**Typhoid**	***Salmonella typhi***
2	**Tetanus**	***Clostridium tetani***
3	**Cholera**	***Vibrio cholerae***
4	**Tuberculosis (TB)**	***Mycobactertium tuherculosis***
5	Anthrax	*Bacillus anthracis*
6	Leprosy (Hansen's disease)	*Mycobacterium leprae*
7	Diphtheria	*Corynebacterium diphteriae*
8	Meningitis	*Neisseria meningitidis*
9	Plague (Black death)	*Yersinia (=Pasteurella) Pestis*
10	Botulism (Food poisoning)	*Clostridium botulinum*
11	Syphilis (STD)	*Treponema pallidum*
13	Pneumonia	*Streptococcus pneumoniae*
14	Pimples	*Staphylococcus aureus*

Bacterial diseases in plants		
S.No.	**Plant diseases**	**Causal organism**
1	**Red stripe of sugarcane**	***Pseudomonas rubrilineans***
2	**Citus canker**	***Xanthomonas citri***
3	**Crown gall**	***Agrobacterium tumefaciens***
4	**Bacterial blight of rice**	***Xanthomonas oryzae***
5	**Black rot of cabbage**	***Xanthomonas campestris***
6	Tundu (Bacterial rot) of wheat	*Corynebacterium tritici*

(III) Blue Green Algae (Cyanobacteria):

- They are aerobic photoautotrophic, nitrogen fixing **Gram negative** prokaryotes included into separate class **Cyanophyceae** or **Myxophyceae.** They evolved in **Precambrian period** around **3.2 billion** years ago.
- They are found in all types of habitats - **fresh water (mostly),** marine water & terrestrial.

Note:

(a) ***Oscillotoria brevis*** can survivive in hot water sulpher springs at a temperature of 70^{o}-80^{o} C due to homopolar bonds in their protein.

(b) ***Trichodesmium erythrium*** grow in Red sea and responsible for Red colour of Red sea.

- They can be –

  1. unicellular–e.g. *Spirulina*;

  2. colonial–e.g. *Gloeocapsa, Microcystis*;

  3. filamentous – e.g. *Anabaena, Nostoc, Oscillatoria*.

- The colony are generally surrounded by gelatinous/Mucilaginous sheath (Made up of Mucopolysaccharide).

- **Thylakoids** are **unilamellated,** have **chl a, β carotenes and xanthophyll** and three types of **phycobilin pigments c-phycocyanin, c- phycoerythrin and allophycocyanin**.
- **Reserve food** material is **mainly cyanophycean starch (Structure is similar to glycogen)**. Proteinaceous granules, β granules (Fat droplet) are also found in some forms.
- **They were first to oxygenic photosynthesis to evolve O_2 in photosynthesis.**
- BGA is able to fix atmospheric nitrogen in to ammonium compounds. For this purspose some of their cells become pale yellow and thick walled structure called **heterocysts**. The latter has **nitrogenase enzyme** that performs nitrogen fixation in anaerobic conditions **e.g.** ***Anabaena, Nostoc, Aulosira***.

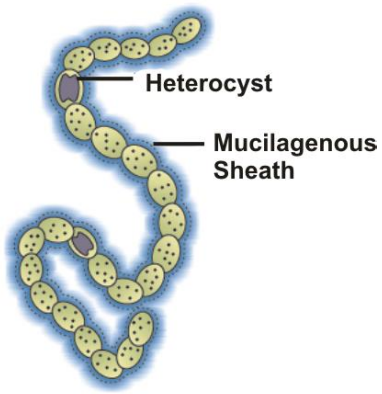

Fig. A filamentous blue -green algae - Nostoc

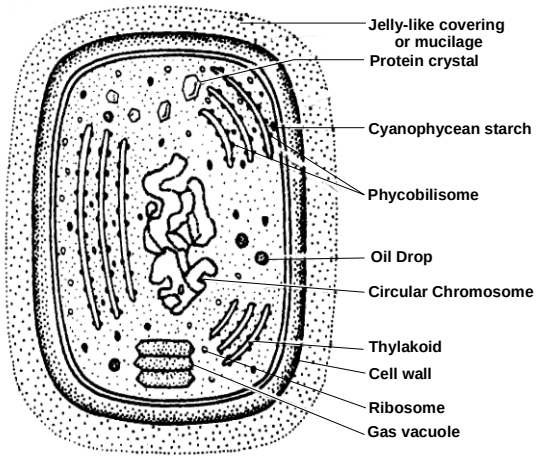

Fig:- Cyanobacteria (BGA) :Ultra structure of cell

- Its cell wall consists of peptidoglycan (inner layer) and lipopolysaccharides (outer layer).
- **Sterol is absent in cell membrane** and the latter contains protein and phospholipid in 2 : 1 ratio.
- Protoplast of cell is differentiated into outer peripheral coloured **chromoplasm** and central colourless region **centroplasm**.

- The chromoplasm has photosynthetic lamellae or thylakoids, 70 S ribosomes.
- **Lamellasome** connects nucleoid to cell membrane and help in respiratory activities, septum formation and separation of replicated DNA.
- Nitrogen filled **gas vacuoles** are found instead of sap vacuoles and they help in **buoyancy** and protection from UV rays.
- Definite nucleus and definite plastid with grana are absent. Flagella, mesosome, chlorophyll b, meiosis, and all membrane bounded organelle are absent.

Reproduction in BGA

- **Sexual reproduction is absent in BGA** but gene recombination occurs by conjugation, transformation, and transduction.
- **Vegetative reproduction:**
  - **(a) Unicellular forms:** Binary fission. It is the most common method of reproduction in BGA.
  - **(b) Filamentous forms:** Fragmentation and Hormogonia (short segments of the filament that form new filament after separation in the region of heterocysts).
- **Asexual reproduction:** Take place by Akinetes formation. Akinetes are formed under unfavourable conditions.

Economic Importance of BGA:

- **(i) BGA** can **fix atmospheric nitrogen e.g. *Aulosira fertilissima* is most active nitrogen fixer in rice fields enriching (upto 20%) rice fields with nitrogen, *Anabaena azollae* is found in the leaves of *Azolla* (an aquatic fern) and fix nitrogen hence *Azolla* is introduced in rice fields as biofertilizer. *Nostoc, Tolypothrix, Cylindrospermum*, are other major nitrogen fixers.**
- **(ii)** ***Spirulina maxima*** is **rich in protein (71%)** and vitamins. It is used as Single Cell Protein **(SCP)** for human consumption, poultry, fisheries and feeding for cattles.

(iii) Nitrogen fixing BGA like Nostoc, Anabaena are used as a **green manure** that help in retaining soil moisture along with supply of nitrogen salts.

- **(iv)** Excessive growth of blue green algae (like *Microcystis*) is responsible for the formation of **Algal bloom** in **NO_3 and PO_4 rich water** and cause deficiency of oxygen in water that is responsible for death of fishes.

(v) Colonies of *Nostoc* (called Yuyucho) are consumed as food in China.

(vi) Cynobacteria reduce soil acidity.

Resonate the Concept

- Symbiotic association of BGA for N2 fixation with many plants.
  (a) Nostoc - Anthoceros (thallus), Gunnera (stem) and Trifolium (root)
  (b) Anabaena - Azolla (leaf)
  (c) Nostoc + Anabaena - Cycas (coralloid root)

(IV) Mycoplasma (PPLO):

- **Nocard and Roux (1898) discovered PPLO (Pleuropneumonia like organisms) or MLBs (Mycoplasma like bodies)** from pleural fluids of bovine cattles suffering from pleuropneumonia.
- The term mycoplasma coined by **Nowak (1929).**

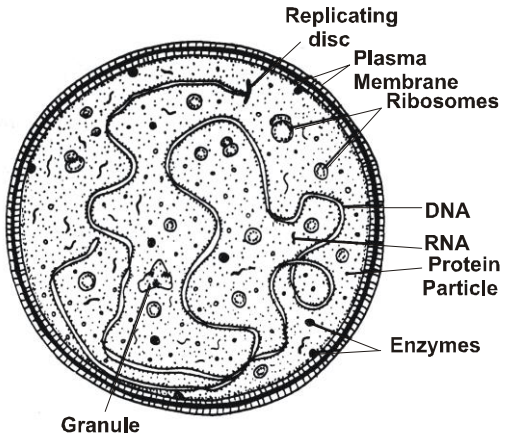

Fig :- Mycoplasma : Ultrastructure

- They are Gram –ve, smallest **(0.1–0.3 μm in size–e.g. *Mycoplasma gallisepticum*)**, unicellular, heterotrophic, wall less and pleomorphic organisms. They can change their shape hence called **jokers of the plant kingdom or mollicutes**. They can pass through bacteria proof filters.

- Facultative anaerobic, **can survive without oxygen**,
- In culture medium their colonies shows **fried egg appearance**.
- Cell membrane is trilaminar, highly flexible and composed of lipoprotein. **DNA is linear not circular,** but coiled and double stranded. 70S type of ribosomes, RNA, protein, fat particles are found in cytoplasm.
- They perform reproduction by **binary fission** and **elementary bodies**.
- They are either saprophytic or **cause diseases in plants and animals.**
- Due to absence of cell wall mycoplasma is insensitive for antibiotic Penicillin but it is sensitive for antibiotic tetracyclin and Chloroamphenicol which inhibit metabolic pathway.

Diseases caused by Mycoplasma

In Plants	In Animals	In Humans
– Little leaf of brinjal	– Pleuropneumonia in cattles	– Primary atypical Pneumonia (M. pneumoni)
– Bunchy top of papaya	– Agalactia of sheep and goat	– Infertility in man (M.hominis)

Test your Resonance with concept

1. In five kingdom system, which one is the main basis of classification is
(1) Structure of nucleus (2) Mode of nutrition (3) Structure of cell wall (4) Asexual reproduction

2. Halophiles grow in concentrated salt solution due to
(1) Bacteriorhodopsin (2) Branched hydrocarbon chain in phospholipids
(3) Active absorption (4) Accumulation of KCl

3. Bacteria possess the organelle
(1) Golgi bodies (2) Mesosomes (3) Mitochondria (4) All the above

4. Which statement is/are wrong with respect to Mycoplasma:
(a) Mycoplasma are the smallest living cells known.
(b) These can survive without oxygen
(c) The Mycoplasma are organisms that completely lack a cell wall.
(d) Mycoplasma can not pass through bacteria proof filters–
(1) b & c (2) c & d (3) only d (4) Only b

5. The Blue-green algae also referred to as _____(i)_____have chlorohyll similar to green plants. Some of these organisms can fix atmospheric nitrogen in specialised cell called_____(ii)_____eg. Nostok & Anabaena._____(iii)_____bacteria oxidise various inorganic substance such as nitrates, nitrites and ammonia & use the released energy for their ATP production.
In above question (i), (ii) & (iii) are respectively.
(1) (i) Cyanobacteria (ii) Chromatophores (iii) Heterotrophic bacteria
(2) (i) Cyanobacteria (ii) Chromatophores (iii) Chemosynthetic autotrophic
(3) (i) Eubacteria (ii) Heterocysts (iii) Chemosynthetic autotrophic
(4) (i) Cyanobacteria (ii) Heterocysts (iii) Chemosynthetic autotrophic

Answers

1. (2) **2.** (2) **3.** (2) **4.** (3) **5.** (4)