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1. History of Mycoplasma:

Mycoplasmas are the “**smallest, independently replicating prokaryotes**”. These organisms were first discovered by Pasteur in eighteenth century when he studied the causative agent of the “Bovine pleuropneumonia” (A pulmonary disease of cattle which appeared in Germany and Switzerland in 1713. Due to its resemblance with pneumonia symptoms this disease is called as Bovine Pleuropneumonia).

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He believed that the disease was caused by some microbe but he could neither observe it nor could culture it. However, it was believed that the causal agent was Pleuropneumonia like organisms (PPLO). This causal agent was first isolated and cultured by E. Nocard and E. R. Roux in 1898. They established that these causal agents of pleuropneumonia can grow on complex nutrient media which do not contain cells.

They also observed that these organisms show different forms, when grown on the culture media. These organisms were named as Asterococcus mycoides by Borrel et. al (1910). The generic name Mycoplasma was given by Nowak (1929) due to their fungi like resemblance.

In “**Bergey’s Manual of Determinative Bacteriology**”. (7th edition, 1957) these groups of organisms have been assigned to a new order Mycoplasma-ales. Edward et al (1967) proposed that these organisms should be placed in a new class mollicutes (Latin, mollis = soft, pliable, cutis = skin) as the organisms lack defined cell wall.

In 1967, a group of Japanese workers, Doi et. al observed that yellow disease of some plants is caused by mycoplasma like organisms. They observed mycoplasma-like bodies in the phloem of plants infected with several leaf hopper transmitted diseases. Ishiie et. al (1967) observed that the mycoplasma like bodies and symptoms disappeared temporarily when the plants were treated with tetracycline.

2. Habit and Habitat of Mycoplasma:

Mycoplasmas are parasitic as well as saprophytic. More than 200 mycoplasma like bodies are found to be associated with sewage, plants, animals, insects, humus, hot water springs and other high temperature environment. They have been found in phloem tissues of diseased plants.

At least eleven serologically and biologically distinct mycoplasmas have been found in man. *M. orale* and *M. salivarium* are found almost in every healthy adult. *M. hominis* is present in a large proportion in sexually active adults. Diseases like primary atypical pneumonia (PAP) in the mouth, pharynx and genito-urinary tract and tonsillitis in humans are caused by mycoplasma.

3. General Characters of Mycoplasma:

1. They are unicellular, smallest, non-motile and prokaryotic organisms forming fried egg shaped colonies (Fig. 5 A, B).

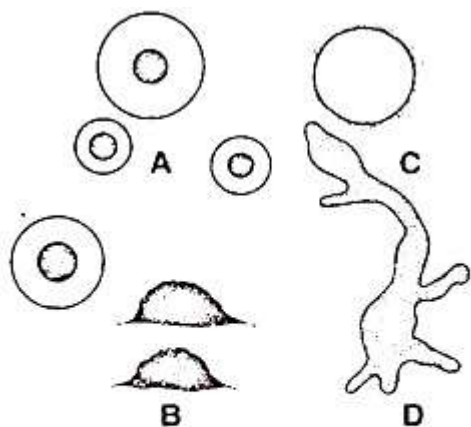


Fig. 5. (A–D). Mycoplasma : Colony morphology and cell shape. A. Entire colony, B. Longitudinal section of colony, C. Spherical form, D. Irregular filamentous form

2. They are pleomorphic i.e., able to change their shape depending upon culture media.

3. They may be rod like, ring like, globoid or filamentous (Fig. 5 C, D). The filaments are of uniform diameter (100-300 nm) and vary in length from 3 nm to 150 nm.

4. Some mycoplasma predominantly assume spherical shape (300-800 nm in diameter).

5. They are ultra-filterable i.e., they can pass through bacteria-proof filters.

6. They do not possess rigid cell wall.

7. The cells are delimited by soft tripple layered lipo-proteinaceous membrane. It is unit membrane about 10 nm thick.

8. Within the cytoplasm ribosomes are found scattered in the peripheral zone. These are 14 nm in diameter and resemble with bacteria in sedimentation characteristic of both the nucleoprotein and nucleic acid.

9. The ribosomes are 72S type.

10. Within the cytoplasm fine fibrillar DNA is present. It is double stranded helix.

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11. Mycoplasma generally grow more slowly than bacteria.

12. They require sterol for their nutrition.

13. They are usually resistant to antibiotics like penicillin, cephaloridine, vencomycin etc. which action cell wall.

14. They are sensitive to tetracycline.

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15. They are also killed by temperature of 40-55°C in fifteen minutes.

16. They do not produce spores.

17. Like other prokaryotes, they usually divide by binary fission.

4. Cell Structure of Mycoplasma:

In mycoplasma, the cells are small varying from 300 nm to 800 nm in diameter. Rigid cell wall is absent. Cells are surrounded by a triple layered lipo-proteinaceous unit membrane (Fig. 6). It is about 10 nm thick. Unit membrane encloses the cytoplasm.

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Within the cytoplasm RNA (ribosomes) and DNA are present. The ribosomes are 14 nm in diameter and 72 S type. DNA is double stranded helix. It can be distinguished from bacterial DNA by its low guanine and cytosine content.

The DNA is up to four percent and RNA is about eight percent and it is less than half that usually occurs in other protoplasm's. The guanine and cytosine (G and C).Contents in DNA range from 23-46 percent. In some species e.g., *M. gallisepticum* some polar bodies protrude out from one or the other end of the cell. These are called bleb and are considered to be the site of enzymatic activities and attachment during

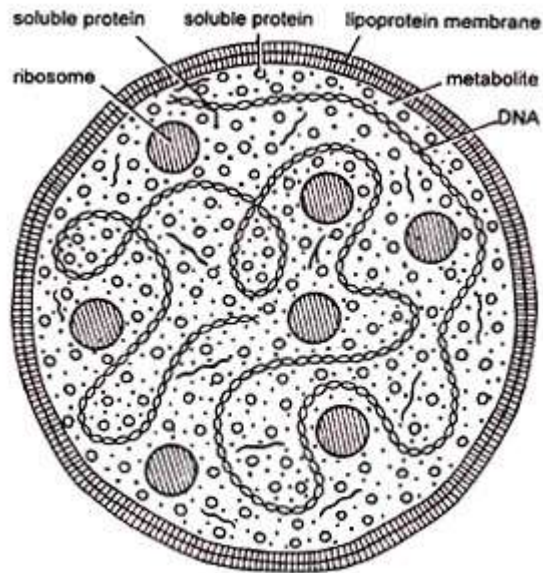


Fig. 6. Mycoplasma. Structure of a typical cell

infection.

Classification of Mycoplasmas:

Based on nutritional requirement, mycoplasmas are divided into the following three genera:

1. Mycoplasma:

They require cholesterol for their growth. They parasitise on animals including man by causing damage to the mucous membranes and different joints of the body.

2. Acholeplasma:

They do not require cholesterol for their growth. They are available in sewage water and soil as saprophytes and in vertebrates and also in plants as parasites.

3. Thermoplasma:

They also do not require cholesterol for their growth. They are aerobic microorganisms showing good growth in acidic pH between 0.96-3.0, with an optimum temperature of 59°C.

Reproduction in Mycoplasma:

Mycoplasmas reproduce by budding and/or binary fission (Fig. 19.12). Cells of mycoplasma divide unevenly into very minute bodies called the elementary bodies or minimal reproductive units.

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These are formed inside the large bodies or mature cells. Their size varies from 330 nm to 450 nm. These bodies are the smallest independent living entities so far known.

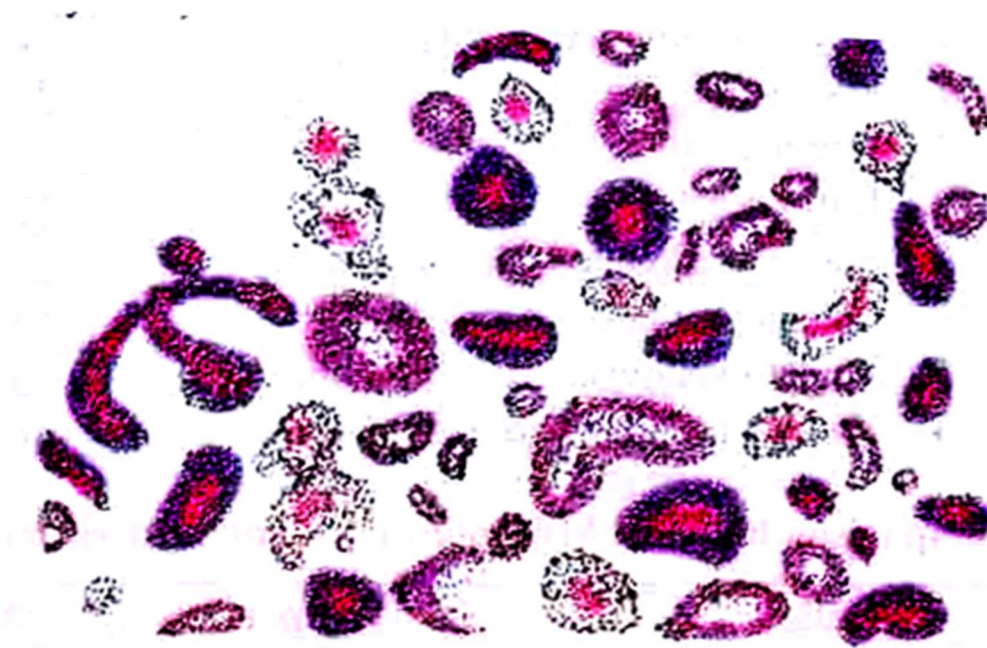


Fig. 19.12. *Several polymorphic mycoplasmas showing binary fission or budding.*

Transmission of Mycoplasma:

Mycoplasma like organisms (MLO) or phytoplasmas are usually present in phloem of the host plants and are transmitted from host to another host by leaf hoppers but some are transmitted by psyllids, treehoppers, plant hoppers and some possibly by aphids and mites.

Some of the pathogens are known to infect various organs of their leaf hopper or psyllid vectors and to multiply in their cells. The vectors cannot transmit the phytoplasma immediately after feeding on the infected plant but it begins to transmit if after an incubation period of 10 to 45 days depending upon the temperature.

Diseases Caused by Mycoplasma:

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Mycoplasmas cause different serious diseases in plants and animals including man.

Some of these are:

(a) Plant Diseases:

(i) Little leaf disease of brinjal.

(ii) Bunchy top of papaya,

(iii) Big bud of tomato,

(iv) Witches broom of legumes,

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(v) Yellow dwarf of tobacco.

(vi) Strip disease of sugarcane.

(vii) Clover dwarf.

(viii) Cotton vires- cence.

(b) Human Diseases:

(i) Primary atypical pneumonia (PAP) by *Mycoplasma pneumoniae*,

(ii) *Mycoplasma hominis* causes pleuropneumonia, prostatitis, inflammations of genitals etc.

(iii) *Mycoplasma fermentans* causes infertility in man.

c) Animal Diseases

(i) *Mycoplasma agalactia* causes agalactia of goat and sheep,

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(ii) *Mycoplasma mycoides* causes pleuropneumonia of cattle.

(iii) *M. bovis* causes inflammation of genitals of different animals.

The economic importances of the mycoplasmas

1. It causes **diseases** to **plants, animals and human**.
2. Some of the *Mycoplasma* species are **commensal** organisms.
3. **Infertility** in human is caused by the three species of *Mycoplasma*.
4. ***Mycoplasma dispar*** is an etiological agent of bronchopneumonia in calves.
5. ***Mycoplasma gallisepticum*** and ***Mycoplasma meleagridis*** causes respiratory disease in the domestic poultry. The disease causes substantial losses in the poultry production.
6. ***Mycoplasma disease of the ruminants*** is a socio-economical problem.
7. ***Mycoplasma pneumonia*** causes disease in the respiratory tract of human beings resulting in the symptoms such as the fever, cough, head ache etc.
8. ***Witches broom of potato, Corn stunt, aster yellow etc.*** are caused by *Mycoplasma*.