

Mycoplasma and Ureaplasma

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Classification

Class: Mollicutes (Mollis- soft, cute- skin)

Order: Mycoplasmatales- 4 families

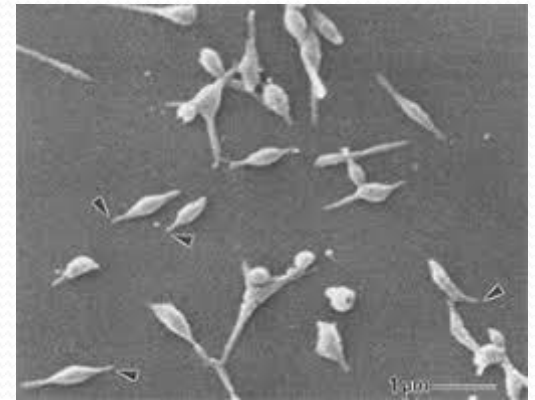
1. **Mycoplasmataceae:** Genera Mycoplasma and Ureaplasma (require cholesterol and sterol for growth)
2. **Acholeplasmataceae:** Genera Acholeplasma (Does not require sterols)
3. **Spiroplasmataceae:** Produce disease in plants only.
4. **Aneroplasmataceae:** strictly anaerobes and found in throats of cattle and sheep.

General characteristics

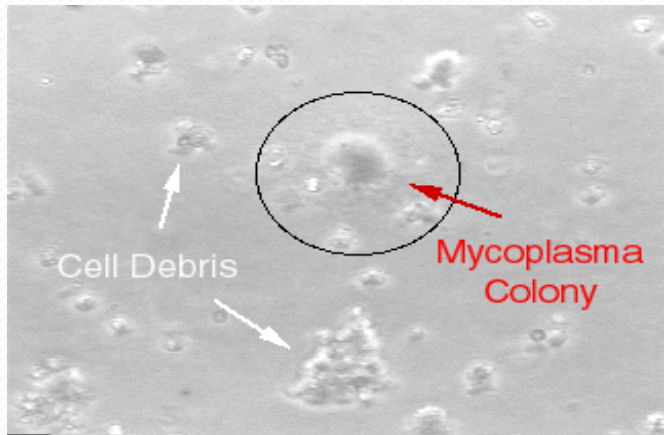
- Lack rigid cell wall resulting in plasticity of organism.
- Cytoplasm surrounded by single triple layerd membrane which contains cholesterol.
- Cannot synthesise their own cholesterol.
- Resistant to cell wall active antibiotics like Cepholosporins and Penicillins.
- Contain both DNA and RNA.
- Ureaplasma can hydrolyse Urea while other genera cannot do so.
- Multiplication is by Binary fission or budding.

Mycoplasma

- Smallest free living bacteria
- Morphology – Small gram negative organism
- Stain well with Giemsa.
- Lack cell walls hence highly variable size & shape. (pleomorphic) .
- Appear as –
 1. Granules- small (125-250 nm) or large (500-1000 nm) of different shapes like ring , disc , baloon , star.
 2. Filaments – slender , branching
No flagella , but show gliding movement



Cultural Characters

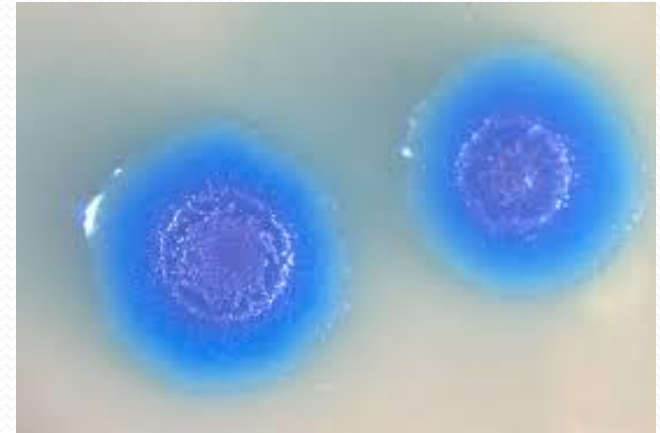


- A/FA/35-37°C/5-10% CO₂
- **PPLO medium**: Require media enriched with bovine heart infusion broth, 20% horse serum (which provides cholesterol), 10% yeast extract, Penicillin, Ampicillin and Polymyxin B (Inhibit bact. Contamination) and phenol red as the indicator.
- Colonies- after 2-3 days, **Fried egg appearance -200-500µm** (examined using hand lens)
- Centre- opaque granular deep
- Periphery- translucent
- Not possible to pick up by platinum loop

Dienes method:

- Block of agar containing the colony is cut and placed on slide.
- Covered with cover slip on which alcoholic solution of methylene blue and azure has been poured and dried.

Subculture is done by cutting a block of agar having colonies and rubbing it on fresh culture plate.



Biochemical Reactions:

- Utilise glucose and arginine as main source of energy.
- Urea is hydrolysed only by Ureaplasma.
- Haemadsorption test: Colonies adsorb guinea pig erythrocytes to their surface
- Tetrazolium reductase test: *M.pneumoniae* colonies reduce tetrazolium to red colour compound and appear red when flooded with tetrazolium.

Resistance:

- Killed by heating at 56°C for 30 minutes.
- Very sensitive to surface active agents and lipolytic agents.
- Resistant to penicillins , cephalosporins and lysozymes but sensitive to Tetracyclines and erythromycin.
- Inhibited by antiseptic solutions like cetrimide and chlorhexidine.

L- forms of Bacteria

- Discovered in Lister institute in London hence named L-forms by Klienberger in 1935.
- Many bacteria either spontaneously or on getting challenged by antibiotics like penicillins lost part or all of their cell wall and developed into L-forms.
- Gram positive Bacteria- Protoplasts
- Gram Negative Bacteria- Spheroplasts

Differences between Mycoplasma and L forms

Mycoplasmas

- Mycoplasmas remain cell wall deficient.
- Do not have remnants of cell wall components.
- Require sterols for growth.
- Filterable
- Initiate diseases.

L Forms

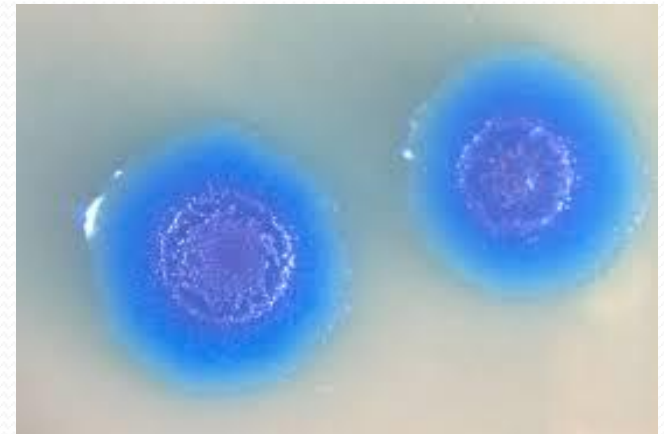
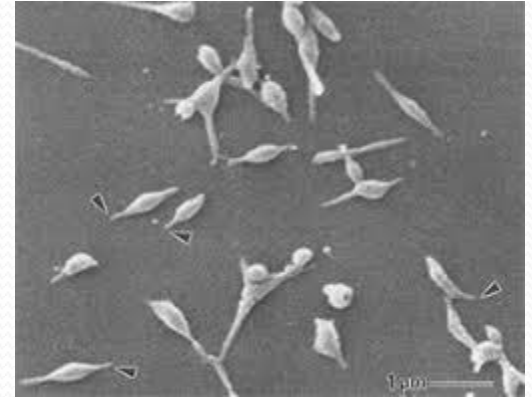
- Revert back to original form on removing the challenge.
- Show remnants of cell wall components.
- Do not require sterols for growth.
- Not filterable
- Cannot initiate disease but plays important role in persistence of chronic infection during antibiotic therapy.

Classification & Pathogenicity

1. *M.pneumoniae* – Primary Atypical Pneumonia
2. *M.hominis* – Genital tract infection- urethritis, endometritis, abortion, postpartum fever, salpingitis, sterility, septicaemia, arthritis
3. *Ureaplasma urealyticum*- 20-25% of Non gonococcal urethritis, Pelvic inflammatory disease (PID), septicaemia, Arthritis

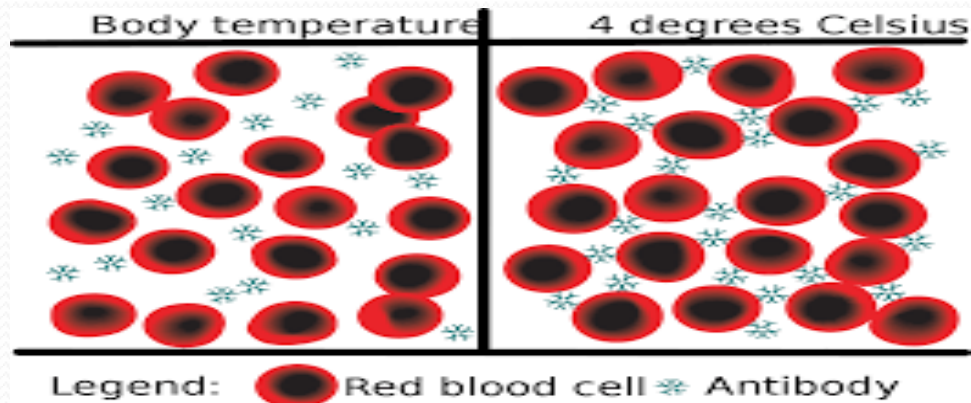
Lab diagnosis

- Samples: throat swabs, nasopharyngeal swabs, respiratory secretions, sputum, urethral secretions, cervical swabs, urine.
- Grams stain: gram negative pleomorphic forms
- Stained with Geimsa stain- Granules (Baloon, star, ring, disc) or filamentous forms
- Culture on PPLO medium : Fried egg colonies- Identified by Dienes method.
- Further identified by Haemadsorption and tetrazolium reductase test.
- Urea is hydrolysed by *Ureaplasma urelyticum*.



Lab diagnosis

- **Serology:** CIEP, EIA, Immunofluorescence, HI, CFT.
- **Streptococcus MG test:** serial dilution of pts serum mixed with strep MG strain- agglutination.
- **Cold agglutination test:** antibodies against mycoplasma can react with human group O erythrocytes at low temp 4°C. clumping dissociates at 37°C.



Treatment

- Tetracycline and erythromycins are the drug of choice.

Important questions:

Short answer questions:

1. Lab diagnosis of Mycoplasma.
2. General characteristics of Mycoplasma.
3. L- forms.
4. Differences between Mycoplasma and L forms.
5. Dienes method and Dienes phenomenon.

Also Asked in MCQs

Thank you!

