

Mycoplasmas

General features

- Belong to Mollicutes
- Smallest procaryotic cells capable of self replication
- Genome size of *Mycoplasma* and *Ureaplasma*- 5×10^8
- Lack genetic ability to form cell wall
- Enclosed in plasma membrane composed of protein, glycoprotein, phospholipid
- They are plastic and peomorphic

- Cell forms include cocci, spirals, filaments, and rings
- Characteristically form fried egg shaped microcolonies
- Most are facultative anaerobes or microaerophiles
- Stain poorly with Gram stain
- Better with Giemsa and other Romanowsky stains
- Consist six genera
- Species of genera-*Mycoplasma*, *Ureaplasma* and *Acholeplasma* important
- First organism in the class was *Mycoplasma*

Table 114. Differential features of the genera of mycoplasmas (mollicutes).

Genus	Cholesterol requirement	Habitat	Other features
<i>Mycoplasma</i>	+	Animals	Many are animal pathogens Optimal pH 7.5 Microcolonies 0.1–0.6 mm in diameter
<i>Ureaplasma</i>	+	Animals	Some associated with disease Optimal pH 6.0. Produce urease Microcolonies 0.01–0.05 mm in diameter, called 'T-mycoplasmas' (T = tiny)
<i>Acholeplasma</i>	–	Animals, soil, sewage	Many saprophytic, a few associated with disease in animals Microcolonies 0.1–1.0 mm in diameter
<i>Spiroplasma</i>	+	Plants, insects	Some cause disease in plants and insects. Helical and motile forms
<i>Anaeroplasma</i>	v	Rumen of sheep and cattle	Commensals Anaerobic
<i>Thermoplasma</i>	–	Acid hot springs	Saprophyte. Optimal growth temperature 59°C and pH 1 to 2

+ = cholesterol required; – = cholesterol not required; v = strains vary in requirement for cholesterol.

Pathogenesis

- Parasitic *Mycoplasma* adhere to host mucous membranes
- Organism are extracellular
- Produce haemolysins, proteases, nucleases, other toxic factors
- *M. neurolyticum* produce neurotoxin
- Some pathogenic species have predilection for mesenchymal cells, lining joints and serous cavities
- Respiratory tract and lungs site of infection

- Destroy cilia in respiratory tract predispose to secondary bacterial invasion
- Infection is frequently chronic
- Infection is either endogenous or exogenous
- Transmission by venereal, vertical, or by aerosols and avian are egg transmitted
- Important diseases in Poultry

Mycoplasmas causing significant diseases in domestic animals

Species	Disease
POULTRY	
<i>Mycoplasma gallisepticum</i>	Chickens: chronic respiratory disease. Turkeys: infectious sinusitis. Infections in game birds and imported Amazon parrots
<i>M. synoviae</i>	Chickens and turkeys: infectious synovitis
<i>M. meleagridis</i>	Turkeys: <i>Mycoplasma meleagridis</i> disease (MM disease), an air sacculitis and bursitis in young birds
<i>M. iowae</i>	Turkey poults: air sacculitis, stunting and leg deformities. Mortality of turkey embryos can occur
<i>M. anatis</i>	Ducks: sinusitis
PIGS	
<i>M. hyorhinis</i>	Chronic progressive arthritis and polyserositis in 3–10-week-old pigs
<i>M. hyosynoviae</i>	Mycoplasmal polyarthritis in 12–24-week-old pigs
<i>M. hyopneumoniae</i>	Enzootic ('virus') pneumonia of pigs
CATTLE	
<i>M. mycoides</i> subsp. <i>mycoides</i> (small colony type)	Contagious bovine pleuropneumonia (CBPP) (Africa, Middle East, China)
<i>M. bovis</i>	Mastitis, arthritis, pneumonia, genital infections, abortion
<i>M. bovis genitalium</i>	Vaginitis, arthritis, mastitis, seminal vesiculitis
Ureaplasmas including <i>U. diversum</i>	Vulvovaginitis, pneumonia
<i>M. dispar</i>	Pneumonia (calves)
<i>M. californicum</i>	Mastitis
<i>M. canadense</i>	Mastitis
<i>M. bovoculi</i>	A predisposing cause of infectious bovine keratoconjunctivitis (<i>Moraxella bovis</i>)

Mycoplasmas causing significant diseases in domestic animals

GOATS

<i>M. mycoides</i> subsp. <i>mycoides</i> (large colony type)	Septicaemia, polyarthrits, pneumonia, mastitis, conjunctivitis (North America)
<i>M. mycoides</i> subsp. <i>capri</i>	Contagious caprine pleuropneumonia (CCPP) (Africa, Mediterranean)
<i>Mycoplasma</i> strain F-38	Contagious caprine pleuropneumonia (CCPP) (Africa)
<i>M. putrefaciens</i>	Mastitis, arthritis

SHEEP

<i>M. ovipneumoniae</i>	Pneumonia
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SHEEP AND GOATS

<i>M. agalactiae</i>	Contagious agalactia (USA, Mediterranean, Europe, Asia)
<i>M. conjunctivae</i>	Keratoconjunctivitis
<i>M. capricolum</i>	Polyarthrits, mastitis, pneumonia
<i>Acholeplasma oculi</i>	Keratoconjunctivitis

HORSES

<i>Mycoplasma felis</i>	Pleuritis (a commensal that can enter the pleural cavity after severe exercise)
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DOGS

<i>M. cynos</i>	Pneumonia (part of 'kennel cough' complex)
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CATS

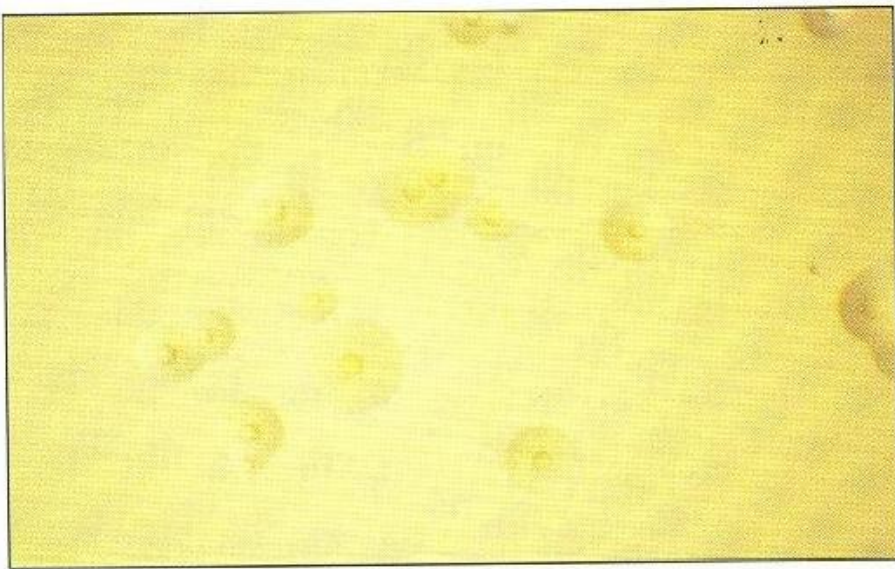
<i>M. felis</i>	Conjunctivitis
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Lab diagnosis

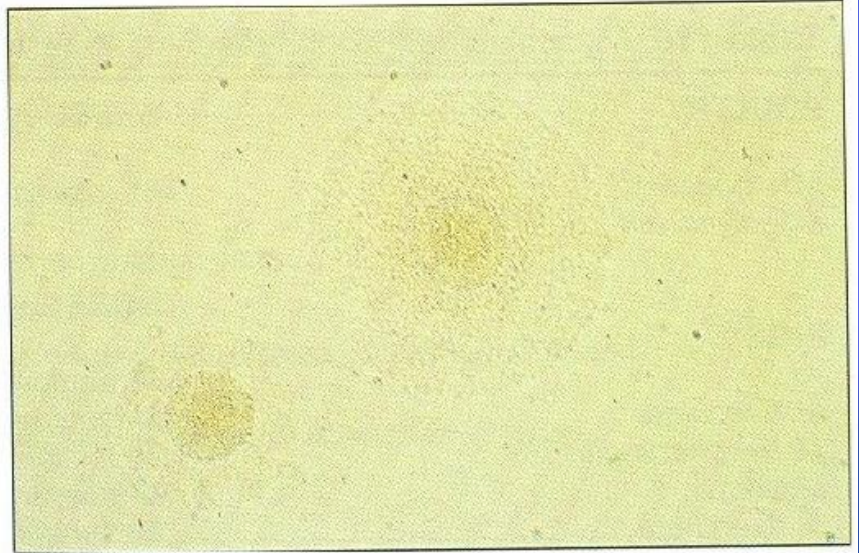
- **Specimen-**
- Mycoplasmas are fragile so refrigerated until delivered to lab
 - Mucosal scrapping
 - Trachael exudate
 - Aspirate
 - Cavity/ joint fluid/mastitic milk
- **Culture media**
- Good quality beef infusion with supplement
- Mycoplasma and Ureaplasma require cholesterol
- Ureaplasma require addition of urea
- Commercially PPLO agar, modified Hayflicks medium

- **Incubation**

- Humid atmosphere at 37 C
- Incubate in duplicate plates-one aerobically and one under 5% Carbon dioxide and 95% nitrogen
- Plates examined after 48-96 hrs
- Plates viewed under stereoscope microscope



375 Unstained mycoplasmal microcolonies illustrating the characteristic appearance. ($\times 10$)



376 Unstained microcolonies of a *Mycoplasma* species showing the typical 'fried-egg' morphology. ($\times 25$)

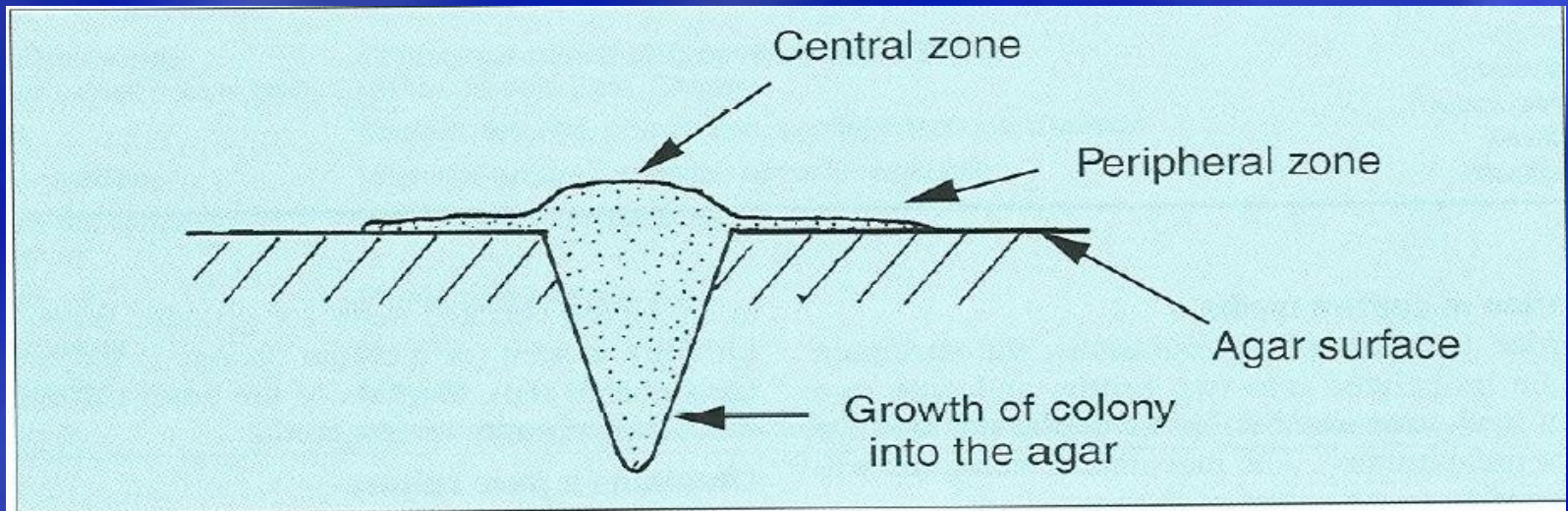
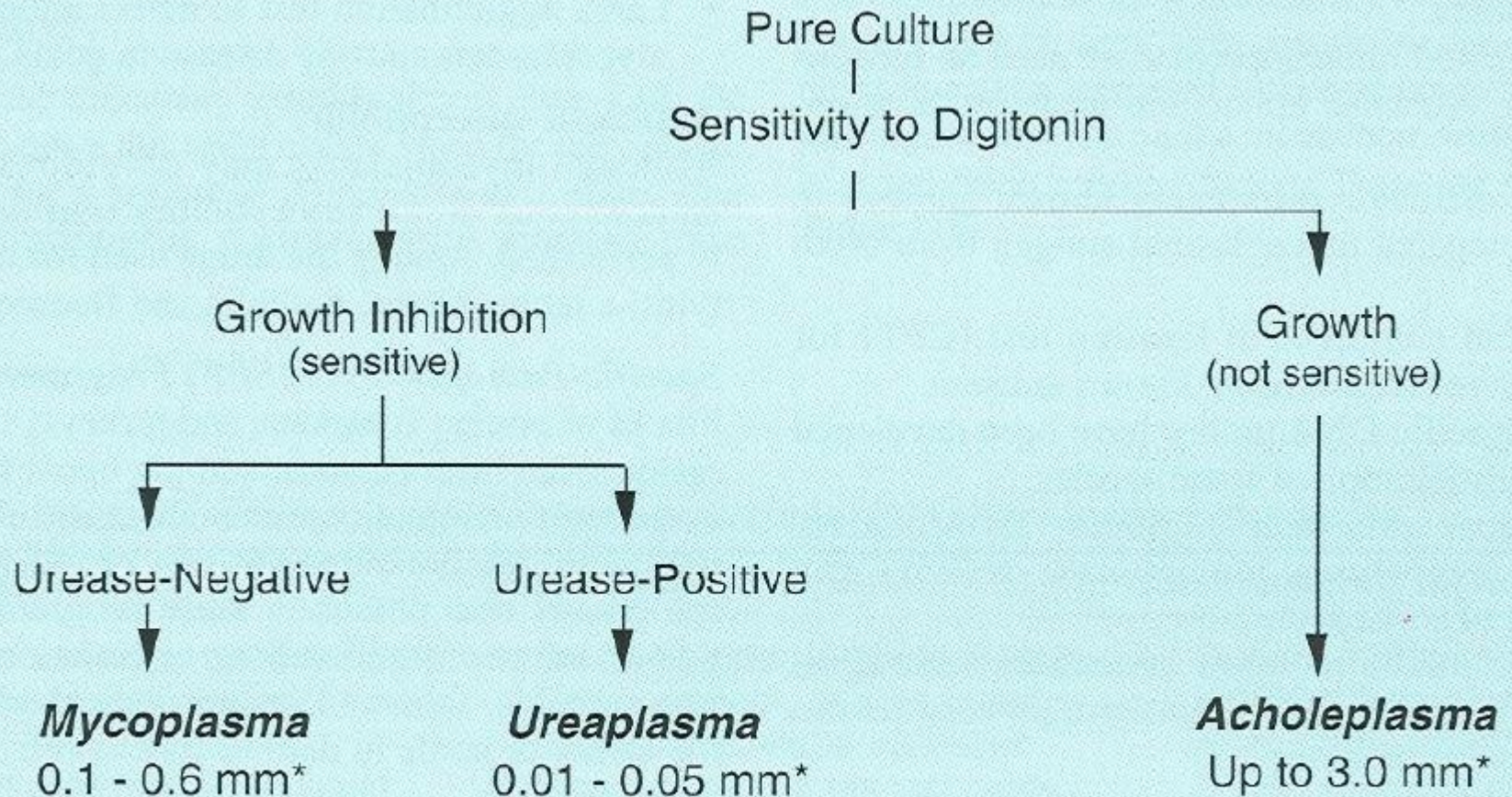


Diagram 41. Section through a mycoplasmal colony showing surface and subsurface growth.

Differentiation of the three mycoplasmal genera isolated from animals.



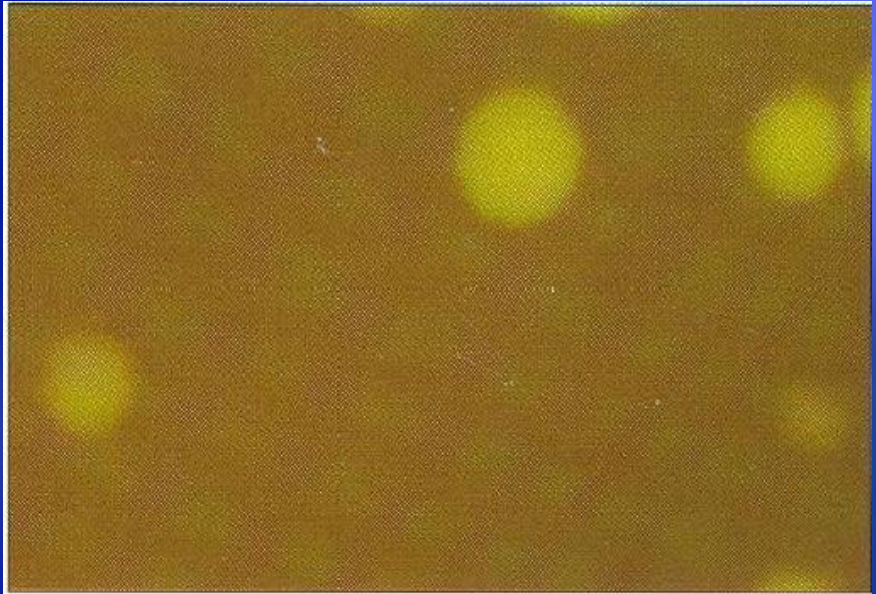
* (diameter of microcolonies)

Identification of species

- Knowledge of animal species and disease process help
- Precise identification require following techniques
 - Flourescent antibody
 - ELISA
 - Agar gel diffusion test
 - Complement fixation test
 - Biochemical tests viz glucose fermentation, arginine hydrolysis, phosphatase activity, reduction of tetrazolium
 - Metabolic inhibition test
 - Growth inhibition test



377 Mycoplasmal microcolonies. (Dienes' stain, $\times 25$)



378 Microcolonies of *Mycoplasma bovis*. (Direct FA technique, $\times 25$)

The end