

The Genera Mycoplasma and Ureaplasma

Veterinary Microbiology

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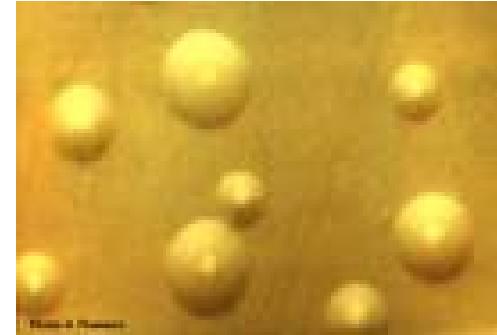
Channarong Rodkhum D.V.M. (Hons), Ph.D.

**Department of Veterinary Microbiology
Faculty of Veterinary Science
Chulalongkorn University**

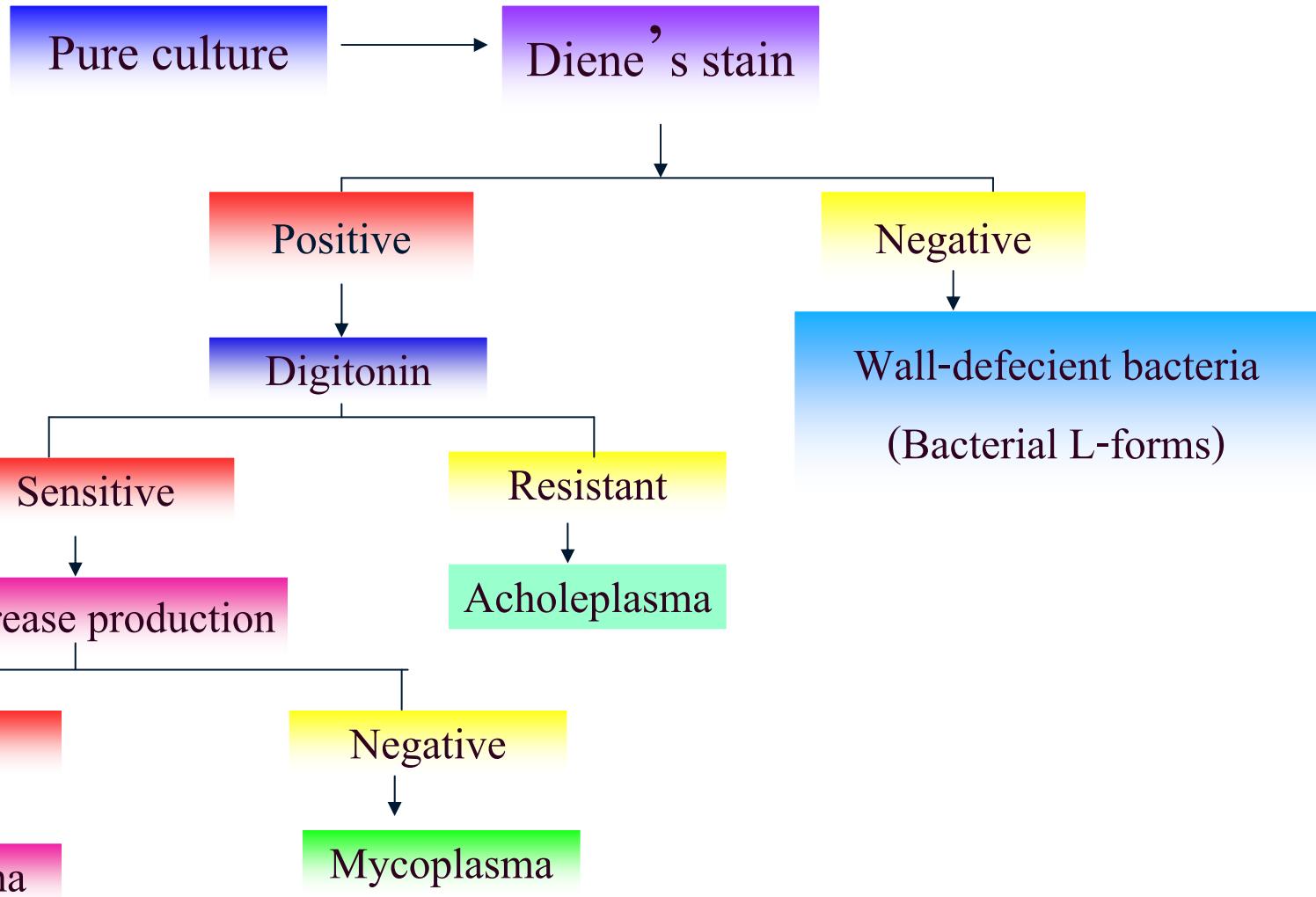
The genera Mycoplasma and Ureaplasma

General characteristics

- Family Mycoplasmataceae
- Class mollicutes
- Lack of cell wall synthesis
- Resistant to β -lactam antibiotics
- Gram stain is not a part of identification process
- Sensitive to digitonin (Deleterious effect on sterols)
- Widely distribute in humans, mammals, birds, reptiles, and fish
- Associated mainly with respiratory, arthritic and Genito-urinary tract diseases excepted for hemotrophic mycoplasma or hemoplasma (Erythrocytes's parasite)



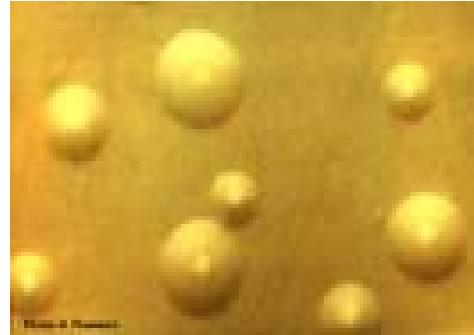
Mycoplasmataceae



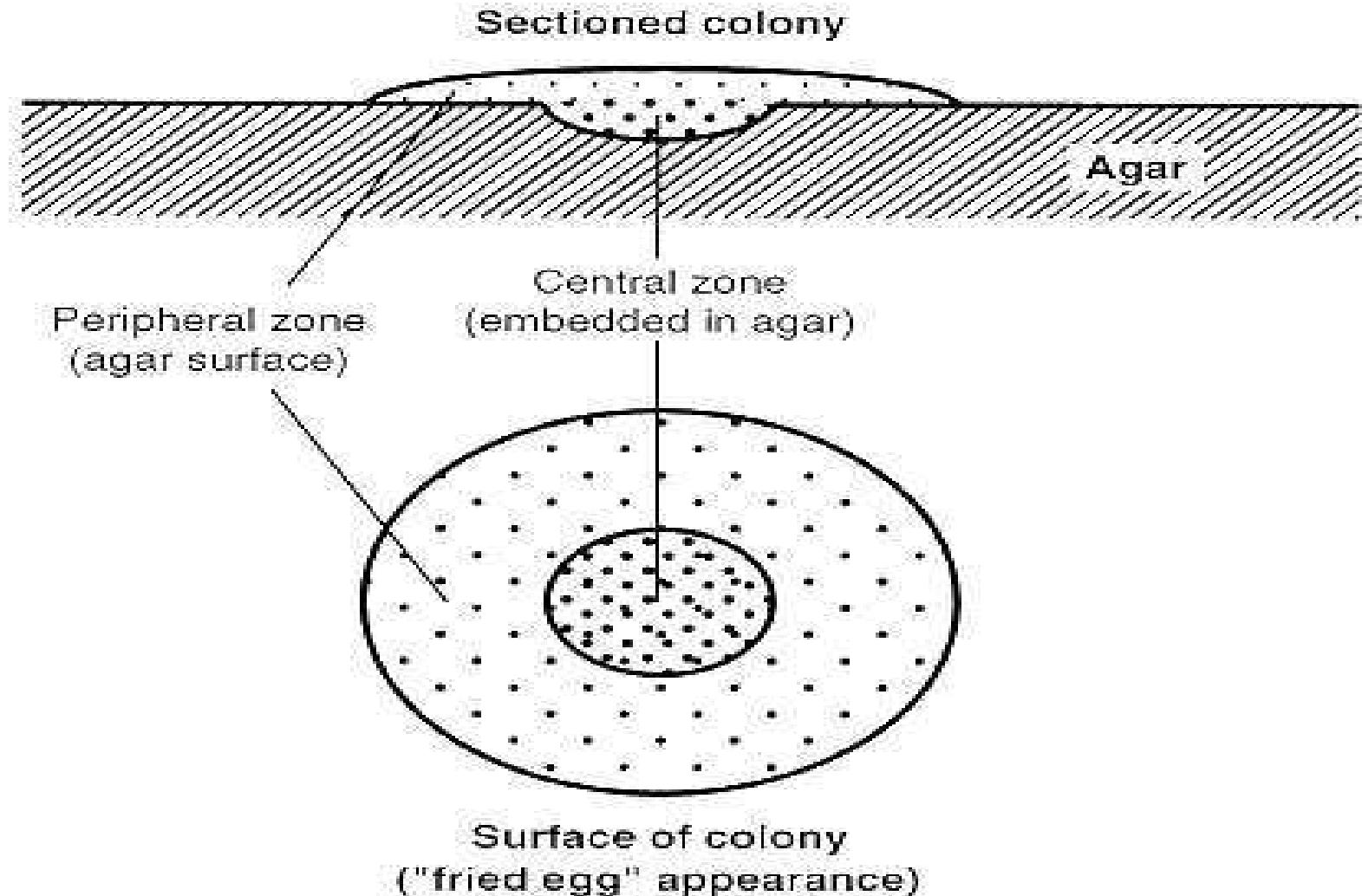
The genus Mycoplasma and Hemotrophic mycoplasma

Characteristics

- More than 100 species
- Diameter 0.3-0.8 μm
- Simple structure (Ribosome + DNA)
- bound by a trilaminar cytoplasmic membrane (Sterols, phospholipids, and proteins)
- Most are facultative anaerobe, except for *Mycoplasma pneumoniae* → strict aerobe
- Grow slowly (4-5 days on agar)
- Hemotrophic mycoplasma : grow on surface of RBCs



Mycoplasma colony



Diseases and Epidemiology

- Human
- Mammal
- Reptile
- Fish

TABLE 37-1 Taxonomy and Properties of Mycoplasmas Capable of Infecting Humans^a

Genus	No of Established Species	Genome Size (kbp)	G+C Content (mol%)	Cholesterol Requirement	Distinctive Properties	Hosts
<i>Mycoplasma</i>	98	580-1300	23-40	+	None	Humans, other animals
<i>Ureaplasma</i>	6	760-1140	27-29	+	Urease positive	Humans, other animals

^aThe table includes only *Mycoplasma* and *Ureaplasma*, the mycoplasma genera that contain species capable of infecting humans. The genera *Acholeplasma*, *Asterolesplasma*, *Anaeroplasma*, *Mesoplasma*, *Entomoplasma*, and *Spiroplasma* contain species infecting only animals, plants, and arthropods.

Mycoplasma in avian

Mycoplasma synoviae

Chicken, Turkey : Synovitis

Mycoplasma iowae

Turkey : Embryo mortality

Mycoplasma meleagridis

Turkey : airsacculitis

Mycoplasma gallisepticum

Turkey : Sinusitis



Mycoplasma synoviae infect
joint in chicken

Mycoplasma in Swine

Mycoplasma hyopneumoniae

Enzootic pneumonia

Mycoplasma hyorhinis

Polyarthritis, polyserositis

Mycoplasma hyosynoviae

Polyarthritis

Mycoplasma in Ruminant

Mycoplasma agalatiae

Goat, sheep : Contagious

Mycoplasma alkalescens

Cattle : arthritistis, mastitis

Mycoplasma bovigenitalium

Cattle : infertility, mastitis

Mycoplasma bovis

Cattle : arthritis, mastitis,
pneumonia, abortions,
abscesses, otitis media,
genital infections

Mycoplasma boviculi

Cattle : conjunctivitis

Mycoplasma dispa

Cattle : Bronchiolitis

Mycoplasma mycoides spp. *mycoides*
(*small-colony type*)

Cattle, Domestic water buffalo :
Contagious bovine pleuropneumonia

Mycoplasma in Dogs and Cats

Mycoplasma cynos

Dog : Pneumonia

Mycoplasma canis

Dog : Urinary tract infection

Mycoplasma felis

Cat : Conjunctivitis, pneumonia

Mycoplasma gatae

Cat : Chronic arthritis, tenosynovitis

Pathogenicity and Pathogenesis

- Damage host cells
- Virulence factors
 - **Cytadhesins** : attaches to cilia of respiratory epithelial cells
 - **Hydrogen peroxide production** : induce oxidative stress in host cells
 - **Membrane-bound phospholipases** : release cytolytic lysophospholipids → disrupting host cell membranes
 - **Modulins** : induce cytokine synthesis → inflammation
 - Immune evasion : antigenic variation → Chronicity

Diagnosis (1) :

- **Culture and identification of bacteria : laborious Time consuming, low sensitivity**
- **Isolation of mycoplasmas from clinical specimens does not confirm their etiological status.**
- **Isolation media : contain sterols, vitamins, amino acids and Adenine dinucleotide**
- **Grow at 37 °C, produce colony after 4-5 days' incubation**

Diagnosis (2) :



- **Colony size : 0.1-1 mm in diameter, dense elevated centers (fried-egg appearance)**
- **Diene's stain : differentiation mycoplasmal colony from cell wall-deficient bacteria (L-form)**
- **Immunologic methods**
- **Molecular biologic methods : PCR, DNA probe**

Hemotrophic mycoplasmas

- Previously classified in order Rickettsiales
Family Anaplasmataceae (Eperythrozoon and Haemobartonella)
- Reclassified as mycoplasma : 16S rRNA sequence and electron microscopy
- Attach to and grow on the surface of RBCs
- Anemia due to RBCs damage, release autoimmune components
- Diagnosis : Blood smears stained (Romanovsky-type stain, Acridine orange staining), Fluorescent antibody test, PCR

Diseases :

Mycoplasma (Eperythrozoon) ovis : Sheep, Goat :
Eperythrozoonosis

Mycoplasma (Eperythrozoon) suis : Pigs :
Porcine eperythrozoonosis or icterohaematochezia

Mycoplasma haemocanis (Haemobartonella canis) : Dogs
Canine haemobartonellosis

Mycoplasma haemofelis (Haemobartonella felis) : Cats
Feline haemobartonellosis

The genus ureaplasmas

Characteristics :

- Family Mycoplasmataceae
- Small colony: 0.02-0.06 mm
- Differentiate them from mycoplasma because the ability to hydrolyze urea
- *Ureaplasma diversum, Ureaplasma cati, Ureaplasma felinum, Ureaplasma canigenitalium, Ureaplasma gallorale, Ureaplasma parvum, and Ureaplasma parvum*

Diseases

Ureaplasma diversum : Common inhabitant of bavine vagina, uterus and oviduct
Cause of granular vulvitis in cow and heifers

Ureaplasma canigenitalium : Canine urinary tract infection

Ureaplasma cati, *Ureaplasma felinum* : Isolate from oropharynx of clinically normal cat

Ureaplasma urealyticum : infection in neonates, severe respiratory disease, meningitis