Chlamydia trachomatis

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Status ?

- Due to filterability & failed to grow in cell free media – viruses
- Possess both DNA & RNA, cell wall, ribosome, replicate by binary fission & susceptible to antibiotics – bacteria
- Considered as bacteria not virus

Classification

- Gram negative
- Small dense elementary body or large reticulate body
- Obligate intracellular bacteria

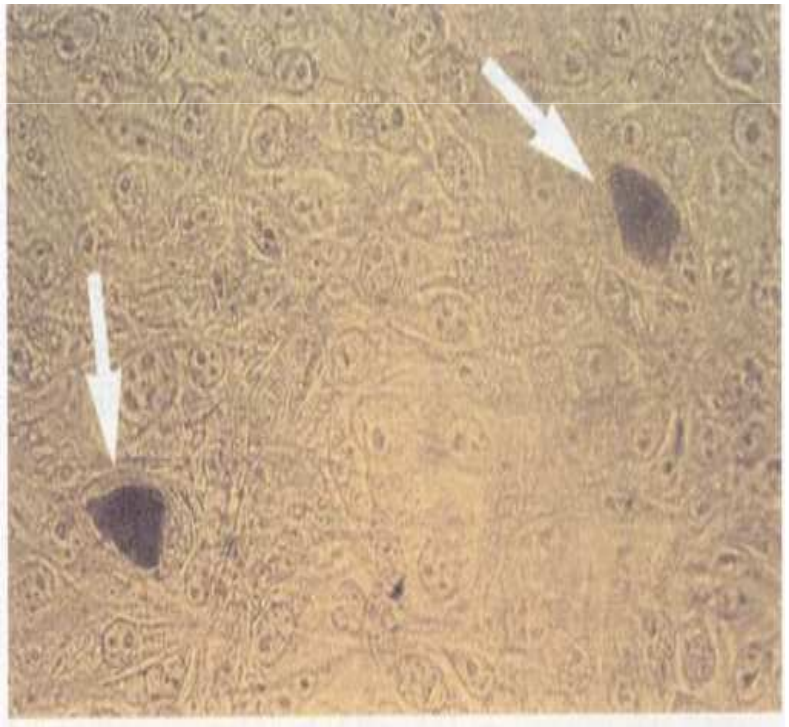
http://www.fujita-hu.ac.jp/~tsutsumi/image/136/2.jpg

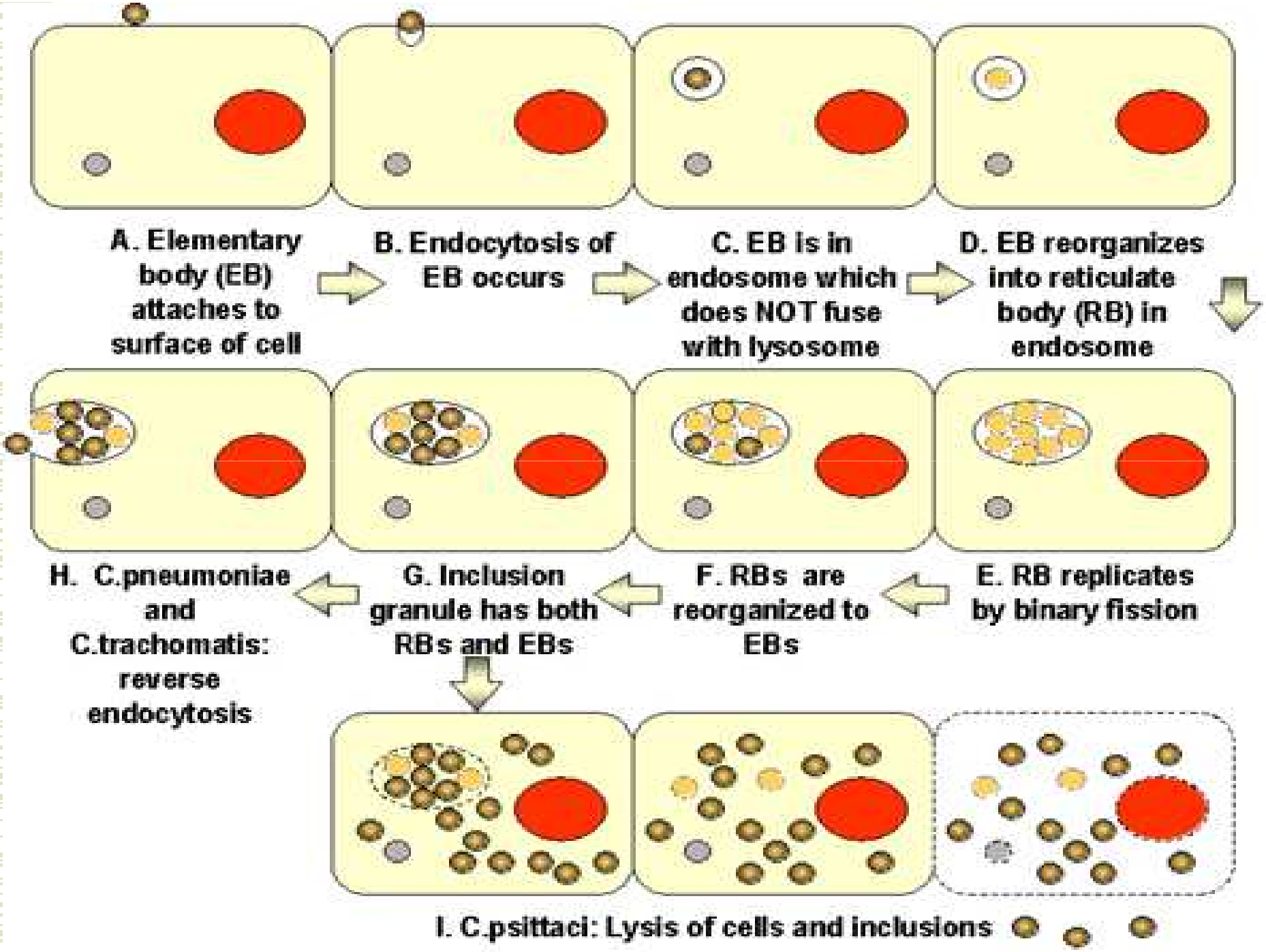
Genus : Chlamydia

- Four species –
  - C. trachomatis — infection of eye & genitals
  - C. pneumoniae — infection of lung
  - C. psittaci — infection of lung in birds
  - C. pecorum

Morphology & Virulence Factors

- Tropism for sq. epi. cells & macrophages of the RS & GUT
- Elementary body
  - 200-300 nm spherical particle
  - Extra cellular infective form
- Reticulate body
  - Intracellular growing form
  - 500-1000 nm size
- Prevention of phagolysosome fusion
- Growth in phagosome




A. Elementary body (EB) attaches to surface of cell
B. Endocytosis of EB occurs
C. EB is in endosome which does NOT fuse with lysosome
D. EB reorganizes into reticulate body (RB) in endosome
E. RB replicates by binary fission
F. RBs are reorganized to EBs
G. Inclusion granule has both RBs and EBs
H. C.pneumoniae and C.trachomatis: reverse endocytosis
I. C.psittaci: Lysis of cells and inclusions

Antigenic structure

- Genus specific Ag (LPS) – CFT
- Species specific Ag (Protein) – species differentiation
- MOMP – Serovars - micro IF

PATHOGENICITY

- C. trachomatis (2 biovars & 15 serovars)

Biovar	Serovars	Disease
TRIC	A, B, Ba ,C	Trachoma
	D to K	Inclusion conjunctivitis, Infant pneumonia, Genital infection
LGV	L1,L2,L3	LGV Hemorrhagic proctitis

Trachoma

- trakhus – roughness of the conjunctiva
- Chronic keratoconjunctivitis characterized by follicular hypertrophy, papillary hyperplasia, pannus formation & cicatrisation.

Introduction

- Ocular infection with Chlamydia trachomatis serovars - A, B, Ba and C
- Second leading cause of blindness worldwide
- Disappearance in Europe and America predated antibiotics

Distribution of disease

- Trachoma is concentrated in hot, dusty, dry parts of the world. Proxy for poverty
- Within endemic countries, trachoma is found in areas that are:
  - Rural
  - Economically underdeveloped
  - Without good water supplies
  - Without basic sanitation
- Since it is an infectious disease, trachoma clusters at neighbourhood and household level

Transmission of Infection

- Transmission of chlamydia from ocular and nasal secretion of children
- Fingers, Fomites, Flies
  - Direct spread by contact with fingers
  - Indirect spread on fomites – toys, pencils, handkerchief etc
  - Eye-seeking flies

Trachoma spread: contact or fly
Disease clinical stages

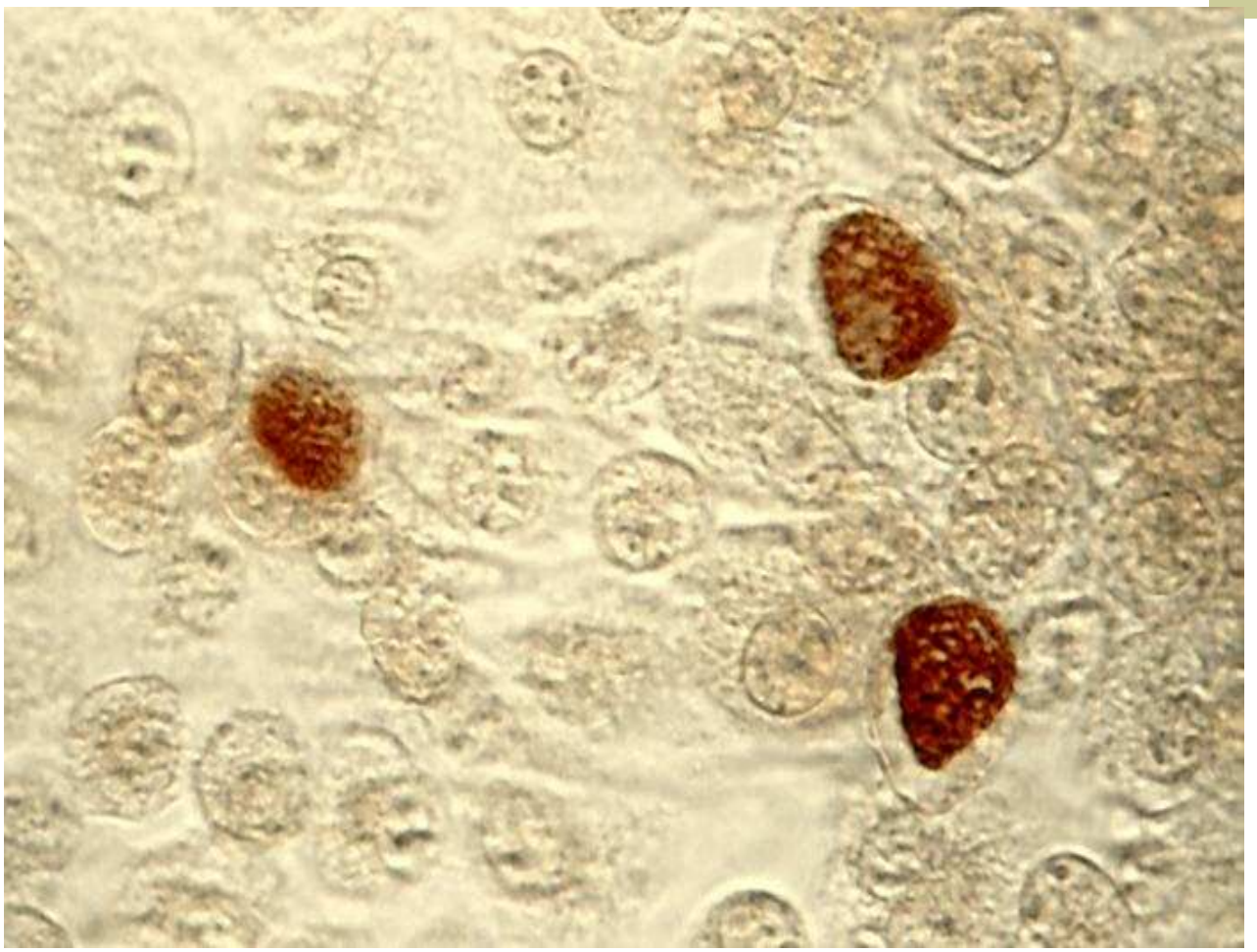



- Follicular inflammation (conjunctiva)
- After reinfections: follicular scarring and fibrosis
- Trichiasis: entropion of the lid, intumed eye-lashes
- Corneal opacity, visual loss

Laboratory diagnosis

- Characteristic inclusion bodies (Halberstaedter-Prowazek or HP) in conjuctival scrapings.
  - Giemsa / Castaneda / Machiavello / Iodine
- Culture in yolk sac of 6-8 day-old eggs
- Tissue culture in stationary phase cells – McCoy or HeLa cells

Iodine stain of inclusion bodies McCoy cell line culture



Intervention: SAFE strategy

- Surgery for trichiasis
- Antibiotics
- Facial cleanliness to prevent transmission of *C. trachomatis*
- Environmental change to prevent transmission of *C. trachomatis*

Inclusion conjunctivitis

2 forms

- Neonatal - **Inclusion blenorrhea**
- Acquired during passage through birth channel
- Mostly benign & self limiting
- Becomes apparent in 5-12 days
- Prevented by local application of antibiotics

- Adult
- Acquired during bathing – Swimming pool conjunctivitis
- Follicular hypertrophy with scanty mucopurulent discharge

Genital infections

Genital chlamydiasis

STD

Serovars D-K

In men

- Non-gonococcal urethritis (NGU)
- Epididymitis
- Proctitis
- Conjunctivitis
- Reiter’s syndrome

In women

- Urethral syndrome
- Bartholinitis
- Mucopurulent cervicitis
- Endometritis
- Salpingitis
- PID
- Conjunctivitis
- Perihepatitis
- Reiter’s syndrome

Symptoms of Genital Chlamydia

- Male
  - Burning sensation during urination
  - Discharge from penis
  - Testicular tenderness or pain - Epididymitis
  - Rectal discharge or pain - proctitis
  - Reiter syndrome
- Female
  - Asymptomatic
  - Burning sensation during urination
  - Painful sexual intercourse
  - Rectal pain or discharge
  - Cervicitis – mucopurulent vaginal discharge
  - Endometritis, Salpingitis, PID
  - Conjunctivitis & Hepatitis

Prognosis

- Early detection and treatment
- Untreated or late detection
  - Complications
  - Scarring
  - Ectopic pregnancy
  - Infertility
- Acquired During Pregnancy
  - Premature labor and delivery
  - Chlamydial conjunctivitis or pneumonia

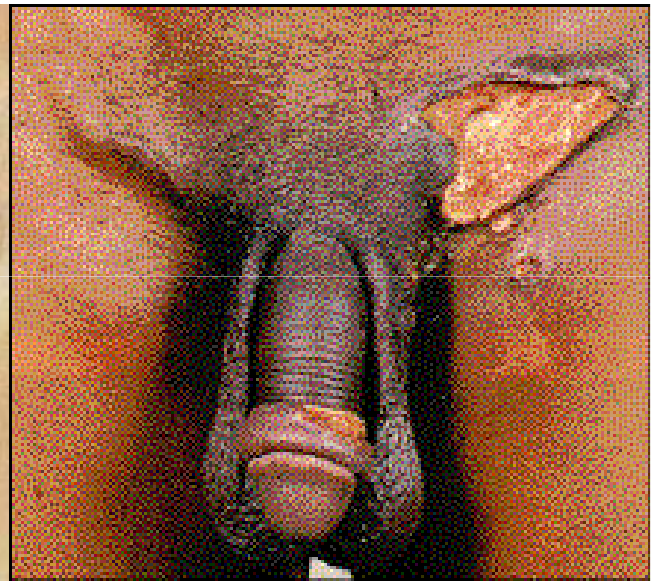
Lab. diagnosis

- Urogenital exudates
  – Gram stain – neutrophils > **4/OIF in urethritis**
  neutrophils > **30/OIF in cervicitis**
- **Isolation** –
  - embryonated egg – yolk sac – 6-8 days old
  - Animal inoculation – mice
  - Cell culture – McCoy, HeLa cell line
- **Antigen detection by**
  - DNA probe test
  - PCR
- **Antibody detection** by Fluorescent antibody assay

Lymphogranuloma venereum (LGV)

- Serovars L1, L2, L3
- More invasive – site regional lymph nodes
- STD – Lymphogranuloma inguinale, proadenitis, climatic or tropical bubo.

LGV



Painless genital papulovesicular

Inguinal adenitis (bubo)

Suppuration, ulcer, discharging sinuses Scarring, ly. blockage

Hemorrhagic proctitis in women & homosexuals

Lab. diagnosis

- Inguinal adenitis (bubo) aspiration – detection of elementary bodies (Miyagawa's granulocorpuscles) – less sensitive
- Cell culture
- Micro-IF – high titre of Abs ($\geq$ 512)
- Frei test (delayed hypersensitivity)

Chlamydophilia pneumoniae

- Was first isolated from the conjunctiva of a child in Taiwan - TWAR stain.
- An important cause of bronchitis, pneumonia and sinusitis.
- Infection is common, especially in adults and transmitted person-to-person by respiratory secretions.

Clinical disease

- Most infections are a symptomatic or mild - persistent cough.
- Can’t be differentiated with other atypical pneumonia - M. pneumoniae, Legionella pneumophila, and respiratory viruses.
- Detected in atherosclerotic lesions in blood vessels. However, the role in the development of atherosclerosis is not clear. (Koch’s postulate)

3. Chlamydophilia psittaci

- Caused Psittacosis (parrot fever). The natural reservoir is any species of birds (Ornithosis)
- Occupational infection in human. Veterinarians, zookeepers, pet shop workers, employees of poultry industry.

C. psittaci has three forms of infection

- Asymptomatic infection
- Transient flu-like illness: high fever, headache, chills, myalgia
- Serious pneumonia: non-productive cough, rashes, CNS involvement is common, carditis, hepatomegaly, splenomegaly

Diagnosis and treatment for *C. psittaci*

- Diagnosis: complement fixation test with group antigen, fourfold rise in specific antibody
- Treatment: tetracyclines or macrolides
- Treat birds with chlortetracycline HCl for 45 days.

C. trachomatis	*C. pneumoniae* *C. psittaci*
Disease mild and chronic	Disease severe
Glycogen in inclusions	Glycogen absent
Inclusions can be stained with iodine	No staining with iodine
Susceptible to sulfonamides	Sulfonamide resistant

MYCOPLASMA

- **Family:** Mycoplasmataceae
- **Genus:** *Mycoplasma & Ureaplasma*

Species: *Mycoplasma pneumoniae*
Mycoplasma hominis
Ureaplasma urealyticum

General Genus Characteristics

- Small, prokaryotic organisms w/ NO PG cell walls
- Enclosed in a single, trilaminar plasma membrane
  - Composed of a lipid bilayer
  - Classified as plastic and pleomorphic
- **Smallest of known free-living, self-replicating prokaryotic cells**
  - Frequently pass through bacteriologic filters
- Medically important species are facultative anaerobes

- Limited biosynthetic capabilities
- Require small, organic molecules for growth
- contain sterols in cell membranes
  - Require external source of cholesterol
- Do not possess spores, flagella or fimbria
- Gliding motility

- Widely distributed in nature, including normal flora of mouth and genitourinary tract of humans and other mammals
- Insensitive to antibiotics that inhibit cell division by preventing cell wall synthesis

Cultural characteristics

- Media enriched with 20% horse or human serum & yeast extract
- Penicillin & thallium acetate
- Colonies (10-100μm) appear after 2-6 d , biphasic with a ‘fried egg’ appearance – hand lens/ Dienes method

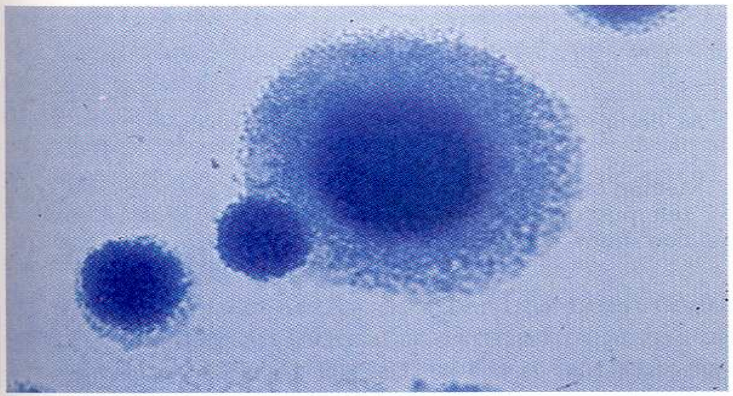


Figure 21-16
Diene's stain of *Mycoplasma* spp. colonies demonstrating typical "fried egg" appearance.

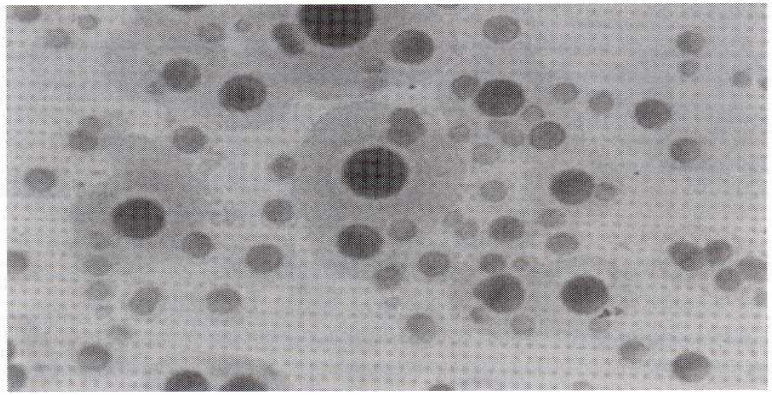


Figure 21-17
Typical mixed sizes of *Mycoplasma* organisms on primary isolation media: *Mycoplasma salivarium*. (Courtesy Bionique Testing Laboratories, Saranac Lake, N.Y.)

Pathogenicity

- Primary atypical pneumonia
- Genital infections

Mycoplasma pneumoniae

- Etiological agent for disease known as **Primary Atypical Pneumonia**
  - Lower respiratory tract infection
- **Mode of Transmission:** person-to-person via respiratory droplets
- **Epidemiology:** worldwide distribution, year-round infection w/ ↑ incidence in late fall and winter
- Cases usu. sporadic; epidemics do occur – among individuals in close contact: schools, prisons, military populations.
- Highest incidence = older children, young adults (6-20 yoa)

- **Pathogenesis**
  - *M. pneumoniae* w/ membrane-associated protein, P1, **cytoadhesion**
    - **Binds sialic acid glycolipids on host cell membranes**
    - **Affinity for ciliated bronchial epithelial cells**
    - **Inhibits ciliary action**
  - Inflammatory response develops in bronchial & adj. tissues as mucosa desquamates

  Organism is shed in saliva several days before onset of clinical disease; re-infection is common

- **Clinical Disease**

  Onset = gradual; starts w/ non-specific sym. w/ fever, chills and malaise

  - After 2-4 days, dry or scantily productive cough develops
  - Possible earache
  - Chest X-ray reveals **patchy, diffuse bronchopneumonia** involving one of more lobes
  - Patients often remain ambulatory thru-out the illness
  - Complications are rare

Mycoplasma pneumoniae

- **Laboratory Identification**
  - Direct microscopic examination of clinical material (sputum, throat swab, respiratory secretions)
  - Sputum analysis: scanty and nonpurulent
    - Cultured on mycoplasma medium containing glucose & phenol red, but isolation in 8-15 days

- **Serological tests** (Ab detection by C' fixation using mycoplasma glycolipid extract Ag) = **best to est. Dx.**
  - dx made if 4-fold ↑ in titer between acute & convalescent samples

- Nonspecific tests

  - Streptococcus Mg test

  - cold agglutination test

Genital Mycoplasma

- ***Mycoplasma hominis & Ureaplasma urealyticum***
  - Common inhabitants of genitourinary tract, particularly in sexually active adults
- ***Mycoplasma hominis*** – causes postpartum / post abortal fever; also involved in PID
- ***Ureaplasma urealyticum*** – common cause of **urethritis** (non-gonococcal, non-chlamydial), proctitis, balanoposthitis & Reiter's syn. in men.

  In females – salpingitis,PID, cervicitis, vaginitis, infertility, premature labor of delivery, low-birth wt. babies, abortion, post partum fever


Thank You