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Mycoplasma -Legionella -Chlamydia

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Typical vs. Atypical Pneumonia

Typical pneumonia

- People need to rest for several days to fight off the infection. Some cases require hospitalization
- Appear suddenly and cause a more serious illness.
- Reproductive cough
- Affects the alveoli
- Occurs in Immunocompetent
- Symptoms are confined to the respiratory system

Atypical pneumonia

- Do not usually require hospitalization, and a person is unlikely to be significantly ill. This is why it is often called walking pneumonia
- Many people can function normally and do most of their everyday tasks with little difficulty.
- have certain symptoms that others with typical pneumonia will often not have. These include a prominent headache, a low-grade fever, an earache, and a sore throat, dry cough.
- Affects the interstitial tissue (parenchyma)
- Occurs in Immunosuppressed
- Symptoms are not confined to the respiratory system
- Requires different antibiotics than typical pneumonia, which is commonly caused by the bacteria *S. pneumonia*.
- Most are hospital acquired.

Mycoplasma

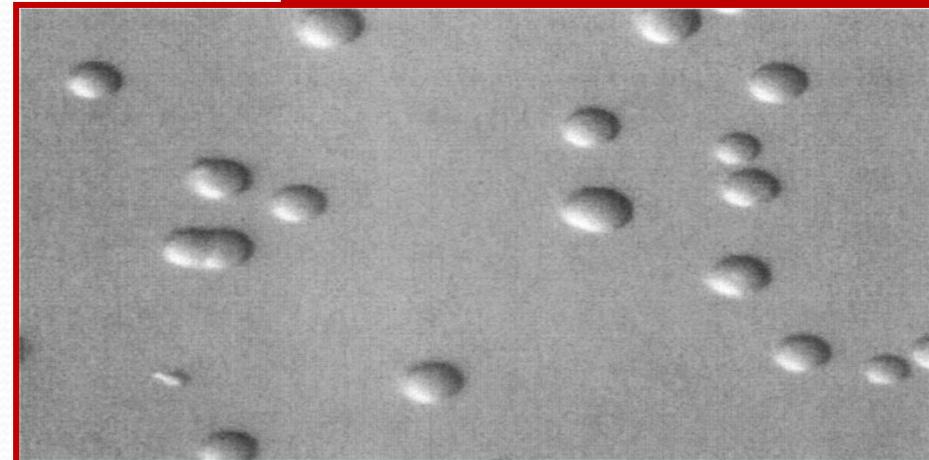
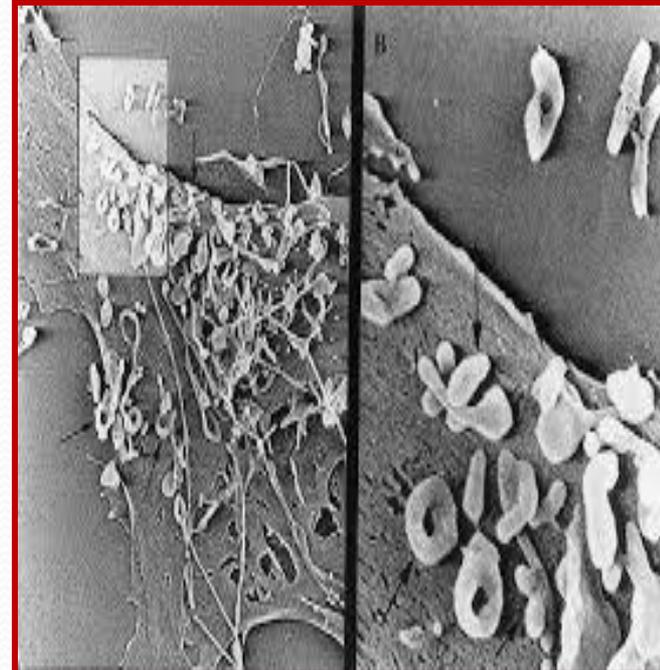
Morphology

-The smallest prokaryotic organism.

- Size: 0.2-0.3 μm .

- Polymorphic:

- Spherical.
- short rod.
- pear shaped.
- filamentous.
- Lack cell wall
- gram negative
- Require complex media for growth.
- Grow slowly by binary fission.



Classification of *Mycolasma*

Organism

1- *M. Pneumoniae*

2- *M. hominis*

3- *M. genitalium*

Diseases

- Upper respiratory tract disease.
- Tracheobronchitis.
- Atypical pneumonia.
- Pyelonephritis.
- Pelvic inflammatory disease.
- Postpartum fever.
- Non-gonococcal urethritis.

Pathogenesis of *M. pneumoniae*

- **Adherence:** *M. pneumoniae* has specific protein (adhesin) localized at the tips of organism to attach it to the respiratory epithelium and erythrocytes. **This adherence leads to:**
 - 1- Ceases of cilia Movement
 - 2- Clearance mechanism stops → coughing
- **Toxic metabolic products** → host cell damage
- **Immunopathogenesis:** Activation of macrophages & stimulation of cytokine production
- *M. pneumoniae* mostly affect school children with the highest infection rate among individuals aged 5-20 years

Clinical pictures

1- Tracheobronchitis: 70-80% of infection.

2- Primary atypical pneumonia:

- Approximately 10-20% of infection.
- Mild disease but of long duration.
- Rarely fatal.
- **Presented with:**

Fever, headache, malaise.

Persistent non reproductive cough.

Sore throat, earache.

3- Rarely, other organs may be involved (CNS, joints, heart & pericardium) as a result of **hematogenous spread.**

Laboratory diagnosis

Direct

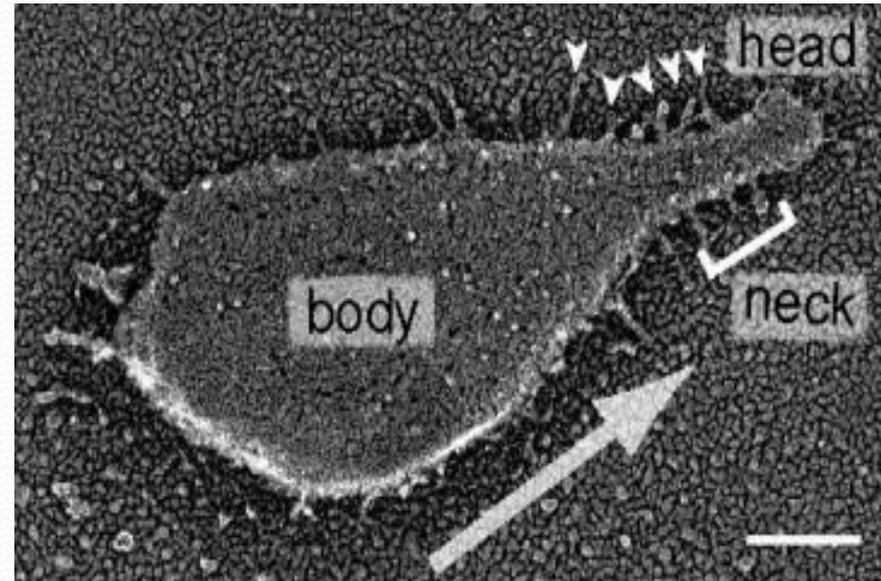
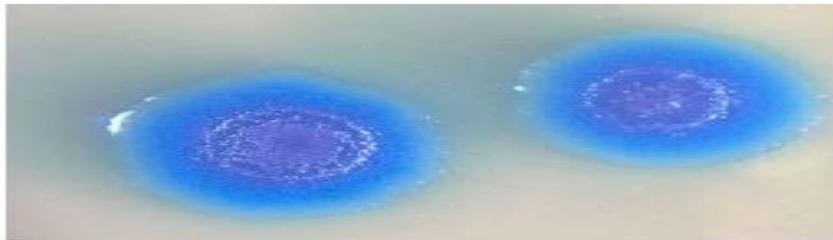
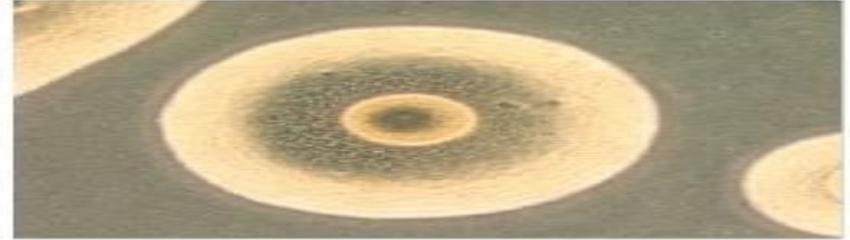
- **Microscopical examination:**
not helpful due to absence of cell wall
so the organism resists gram stain but
can be stained with **Giemsa**.
- **Culture:**
 - it is difficult & time consuming.
 - It takes 2-3 ws to give colonies with
fried egg appearance.

Indirect

- **Serology:** is most useful in the diagnosis.
 - ✓ **CFT or ELISA** : for detection of IgM or rising titer of IgG.
 - ✓ **Detection of cold agglutinins** at a titer of 1/128 or higher indicates recent infection (autoantibodies against red blood cells that agglutinate this cell at 4°C. It is positive in 50%.
- **Antigen detection by immunofluorescence test.**
- **PCR.**
- **Chest x ray.**

“Fried Egg” Colonies of Mycoplasma

M. pneumoniae colonies have a granular appearance



Treatment

1- Tetracycline or erythromycin

2- Fluoroquinolones

Legionella

pneumophilia

General characters

- **Gram negative rods causing outbreak of atypical pneumonia in hospitals.**
- **Motile with polar flagella**
- **Strict aerobe**
- **Require for growth, media containing L- cysteine & iron**



Epidemiology

1- Air borne

2- No man to man transmission.

3- High incidence is in summer.

4- Can cause outbreak at large scale.

5- Predisposing factors:

➤ **Smoking, alcohol, old age.**

➤ **Disease: as chronic pulmonary disease**

➤ **Immunocompromised status: AIDS, cancer, organ transplant.**

Habitat

- **CHAIN OF EVENTS** Bacteria present in water system, slow moving / stagnant water, adequate food source, temperature range 20-50°C , aerosol formed, people present.

Examples on infected water sources:

- **Storage Tanks:** Over capacity
Stagnation Out of sight Poor flow Ambient temps
- **Showers:** Operate at ideal temps
Poor hygiene Infrequently used Prone to scaling Create aerosol
- **Dead pipe ends.**



Mode of transmission & pathogenesis

- *L. pneumophila* enters cooling water system, so infection occurs due to **inhalation of water aerosols** contaminated by this organism
- The organism **multiplies within the phagosome in the alveolar macrophage** and inhibits phagosomal lysosomal granules fusion
- Severe cases associated with damage of **vascular endothelium in brain & kidney.**
- CMI is the most important defense mechanism because of the intracellular growth & survival of the organism.

Clinical picture

Two forms of illness:

1- Pontiac fever:

- **Mild flue- like illness without pneumonia. Self limiting & not fatal**
- **Symptoms: fever, cough, headache, malaise, myalgia.**
- **Persist for about 1 week**

2- Legionnaires' disease (atypical pneumonia):

- **More severe form & can be fatal**

- **Non specific symptoms:**

Fever, fatigue, malaise, myalgia.

- **Respiratory symptoms:**

Cough (dry non productive), hemoptysis, chest pain.

- **Systemic symptoms:**

Neurologic & GI symptoms as headache, disorientation, confusion, nausea, vomiting, diarrhea & abdominal pain.

Laboratory diagnosis

Direct

- **Microscopic Examination:** of samples as bronchial aspirate, pleural fluid, lung biopsy, blood & water samples after staining with silver stain or Giemsa stain.
- **Culture** of specimens on **buffered charcoal yeast extract agar**. It requires **cysteine & iron** to grow

Indirect

- **Serological tests:** Detection of IgM or rising titer of IgG by ELISA test.
- **Detection of *legionella* antigen** in urine using ELISA (rapid, specific test).
- **PCR** for detection of nucleic acids in sputum, urine & other specimens.
- **Biochemical reactions:**
 - The organism is catalase & oxidase positive.

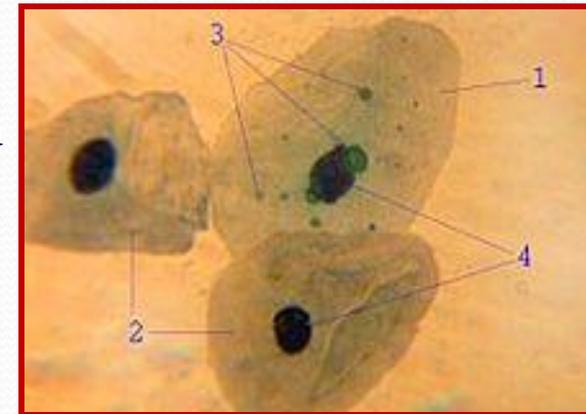
Treatment

- **Erythromycin or Azithromycin (Drug of choice) with or without rifampicin.**
- **Fluoroquinolones.**

Chlamydia pneumoniae

General characters

- An obligate intracellular **Gram –ve bacteria** that infects human.
- It is a **major cause of atypical pneumonia**.
- **In the past it considered as a virus due to:**
 - Their small size (0.2- 1 μm).
 - Can not synthesize ATP for energy so they need to **multiply intracellular** where the host cell or **tissue culture** provides energy & metabolites.
- **They** possess both RNA and DNA, like bacteria

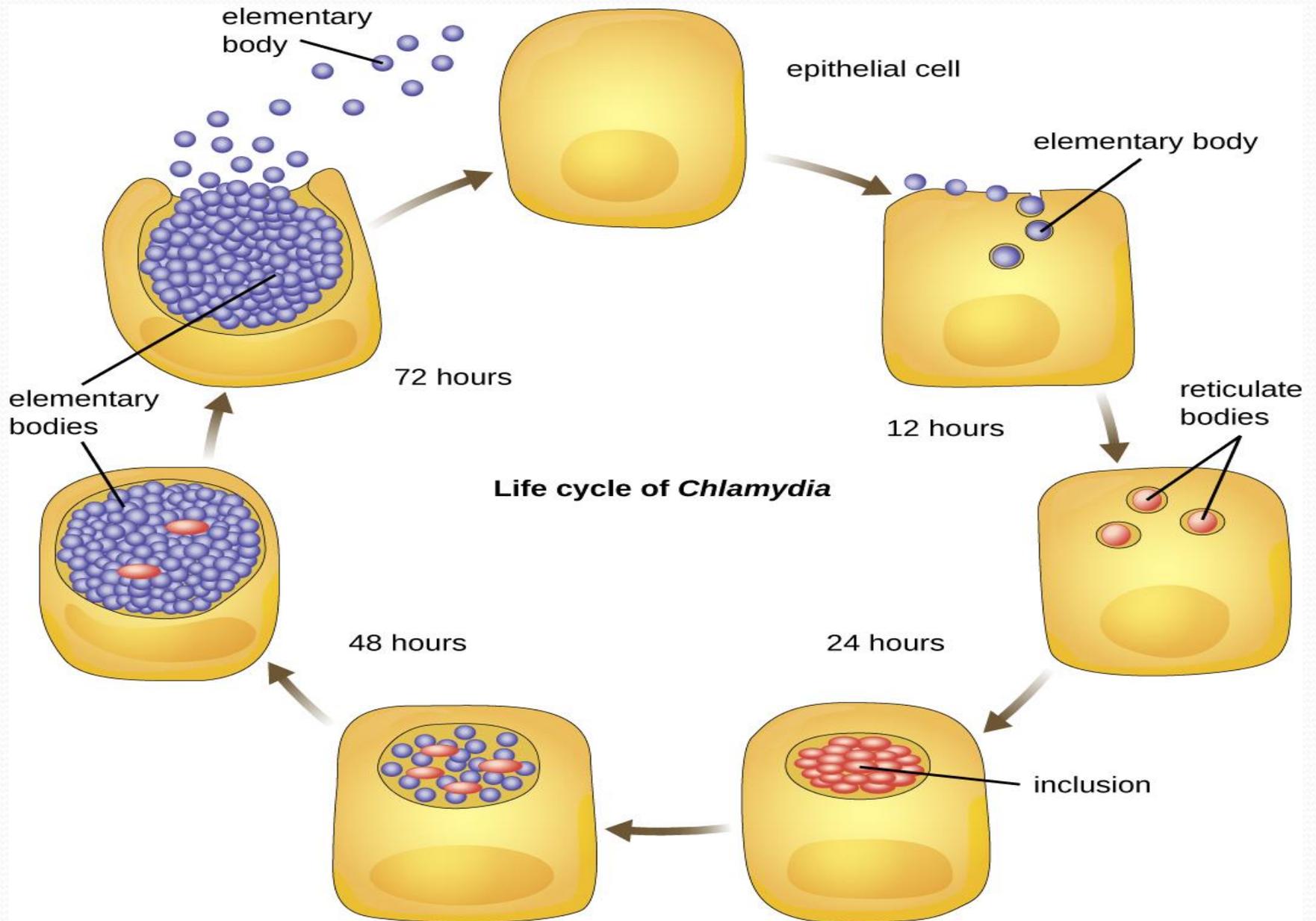


C. pneumoniae

Life cycle

- 1- *Chlamydia pneumoniae* elementary body (EB) is the **infective stage**.
 - 2- Man infected by **droplets infection**.
 - 3- Inside the lung, **EB** is taken by epithelial cells of respiratory tract by phagocytosis like process forming **endosome**.
 - 5- EB transforms into **a reticulate body (RB) that replicates** within the endosome forming **a large numbers of Ebs** that seen in the host cells as intracytoplasmic **inclusion bodies**.
 - 6- The EBs released back into the lung to infect new cells either in the same host or in a new host.
- NB.** EBs are able to infect new cells but can not replicate while RB replicates but not able to cause new infection.
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Life cycle of chlamydia



Pathogenesis & symptomatology

❑ *C. pneumoniae* infect the epithelial cells of the respiratory tract causing bronchitis & atypical pneumonia.

❑ C/P:

1- Most infection is asymptomatic.

2- Mild or moderate symptoms:

➤ Prolonged non reproductive cough, fever, fatigue, bronchitis.

➤ Less common pharyngitis, laryngitis & sinusitis.

➤ **Risk group:** All ages but most common in school age children (5-15 years)

Diagnosis

- 1- Microscopic Examination:** of the specimens (sputum) to detect intra-cytoplasmic inclusion bodies using **Giemsa stain** or **Immunofluorescence stain.**
- 2- Detection of *Chlamydia* antigen** by **ELISA & IFT.**
- 3- Cell culture:** It can grow on **HEP-2** to detect inclusion bodies.
- 4- Serological examination:** Useful in the diagnosis of *chlamydia pneumoniae*.
- 5- PCR.**

Treatment

- **Tetracyclines (drug of choice).**
- **Erythromycin.**