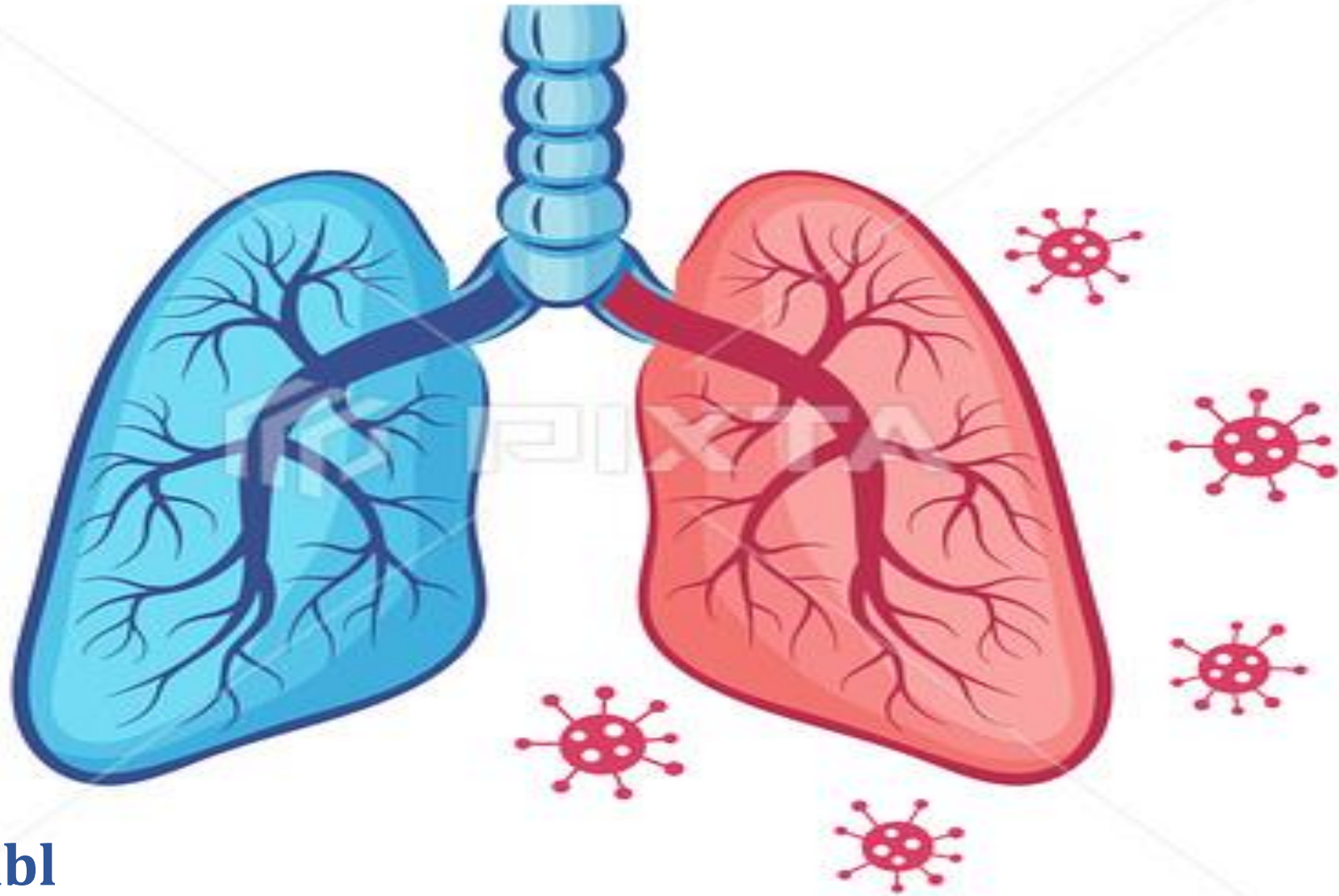


RESPIRATORY TRACT INFECTIONS - V



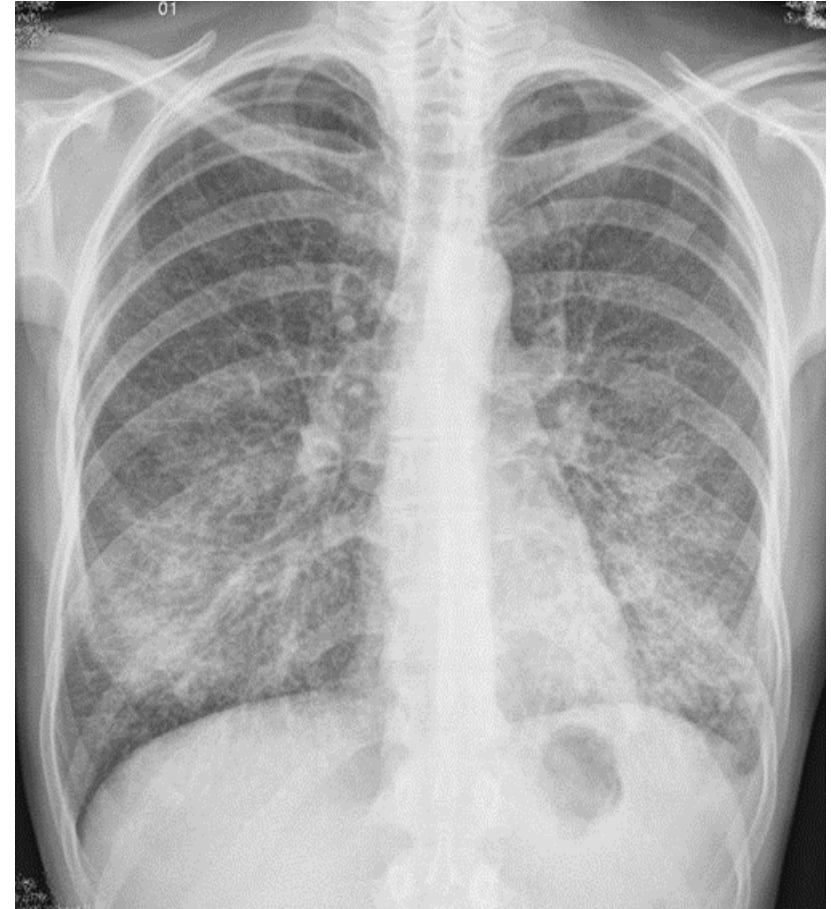
By
Prof. Hala Tabl

ATYPICAL PNEUMONIA

Typical pneumonia	Atypical pneumonia
Sudden onset, severe course commonly require hospitalization	Gradual onset, mild course (do not usually require hospitalization) and self resolution.
Lower respiratory tract involvement	Upper and lower respiratory tract involvement
High fever, dyspnea, chest pain and productive cough	Mild fever, sore throat, fatigue and dry cough
Lobar consolidation on chest radiography	Patchy or interstitial infiltrate
The causative organisms can be isolated on routine media in the diagnostic laboratory	The causative organisms cannot be isolated on routine media in the diagnostic laboratory
Respond to B-lactams	Responded differently to antibiotics
Streptococcus pneumonia Hemophilus influenza Staphylococcus aureus,...	Mycoplasma pneumonia, Chlamydia pneumonia, Chlamydia psittaci, Legionella pneumophila, Coxiella burnetii

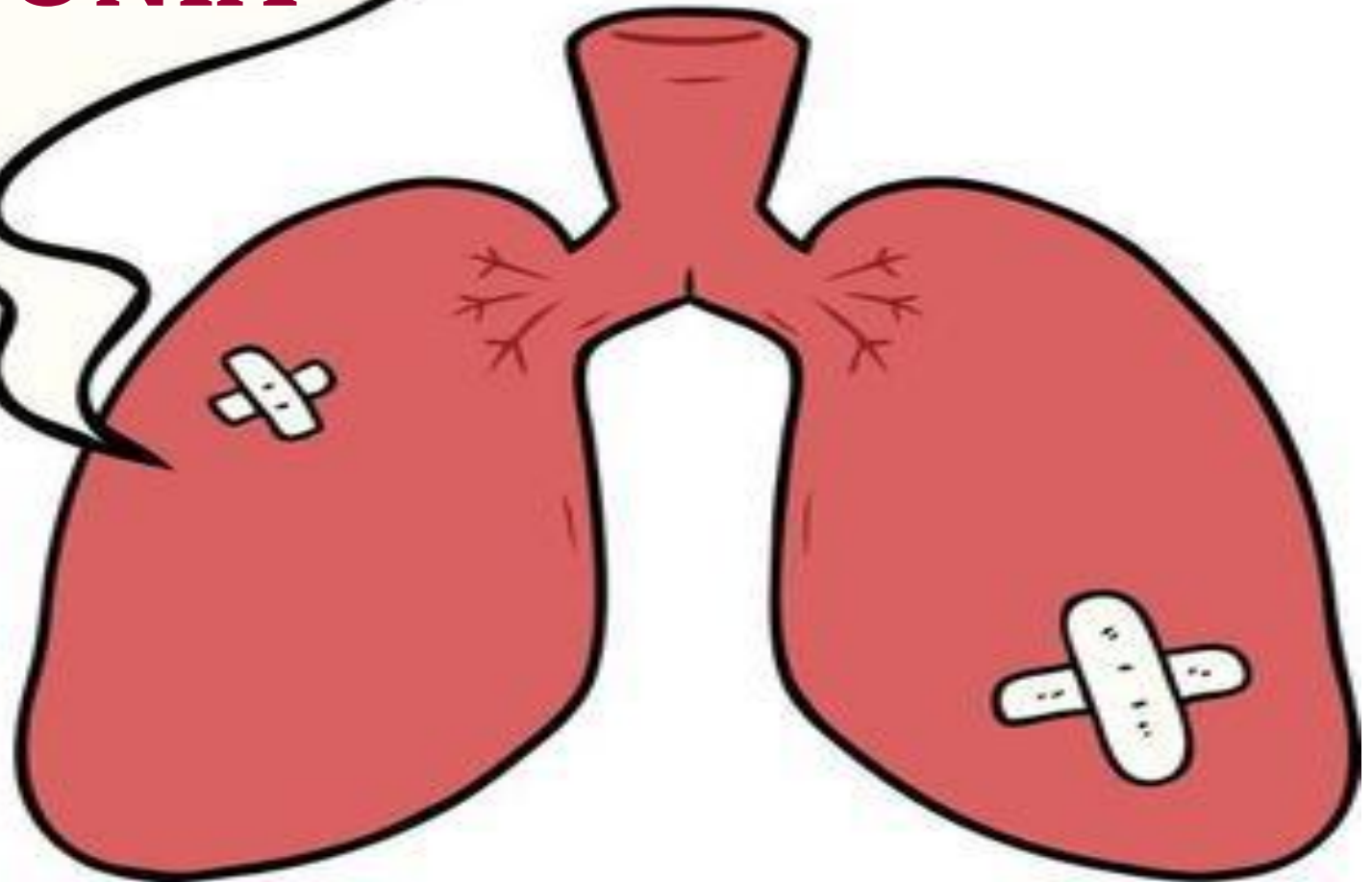


Typical pneumonia



Atypical pneumonia

**MYCOPLASMA
PNEUMONIA**

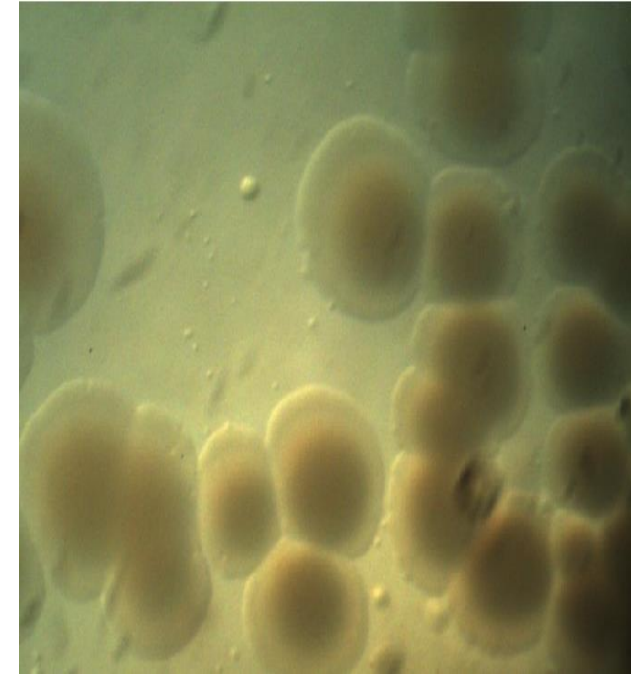


Morphology:

- Very small in size (not seen by ordinary light microscope).
- **Lack a rigid cell wall** and thus they are:
 - ✓ Highly pleomorphic.
 - ✓ Can not stained or visualized with Gram.
 - ✓ Completely **resistant** to penicillins and cephalosporins.
- Plasma membrane is the outermost layer and it is the only bacterial membrane that contains **Sterol** (a sterol usually found in eukaryotic cell membranes).

Cultural characters:-

- Facultative anaerobes; better growth occurs at 10 % CO₂.
- **Require cholesterol for growth** (medium supplemented with sources of cholesterol e.g. **Eaton's agar**).
- They grow slowly (require 2-3 weeks).
- Colonies are very small and typically embedded beneath the agar with raised dark centers and thinner outer edges giving a characteristic **“Fried egg”** appearance (detected with a hand lens or a plate microscope).



Pathogenesis & Clinical findings:

- Transmitted by **respiratory droplets**.
- Mycoplasma pneumonia is **the most common cause of atypical pneumonia** and accounts for about 5% to 10% of all community-acquired pneumonia and **the most common cause of pneumonia in people between the ages of 5 to 15 years**.
- The disease is mild with an insidious onset, mild flu like illness and resolves spontaneously (no need for bed rest or hospital stay) “**walking pneumonia**”.
- During Mycoplasma pneumonia infection, **autoantibodies** are produced against red cells (**cold agglutinins**).

Cold agglutinins

- They are **IgM antibodies** directed against mycoplasma antigen and **cross react** with antigen present on erythrocytes.
- The binding of antibodies to erythrocytes is **triggered by a lower temperature** in the extremities and **causes hemolysis**.
- Cold agglutinin antibodies have been observed in 50–70% of M. pneumonia infections and evidence of subclinical hemolysis.
- Rarely, severe hemolysis with other extra-pulmonary complications such as skin rashes, encephalitis and myocarditis may occur.

Laboratory diagnosis:

Serologic testing: is the **mainstay** of diagnosis.

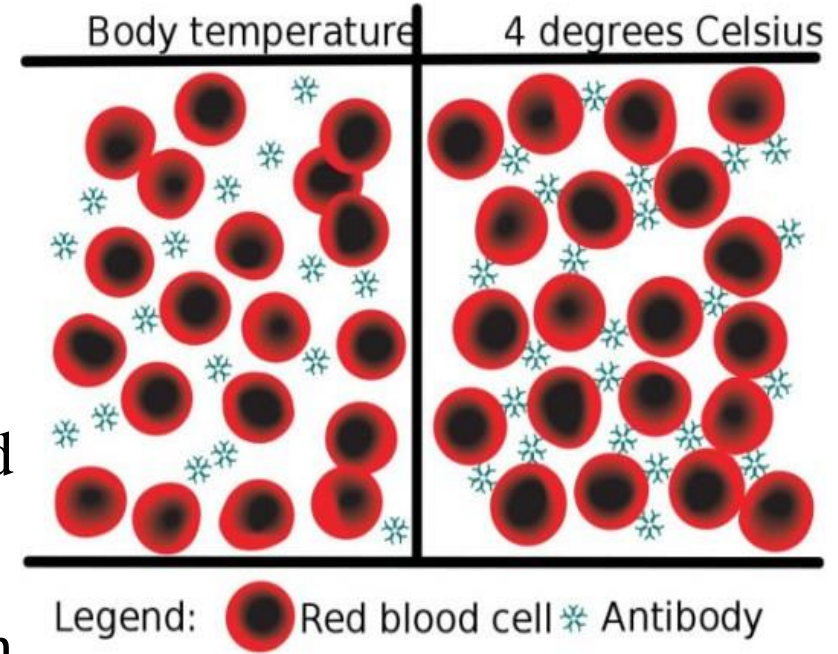
a) Fourfold or greater rise in **specific IgM** antibody titer.

b) **A cold-agglutinin test:**

- Patient serum + human group “O Rh –ve” RBCs and incubated at 4°C.
- Positive result shows clumping of RBCs, which dissociated at 37°C.
- The test is positive in 50-70% of patients.
- The test is **nonspecific** (false-positive results occur in influenza virus and adenovirus infections).

Direct smear: is of no value.

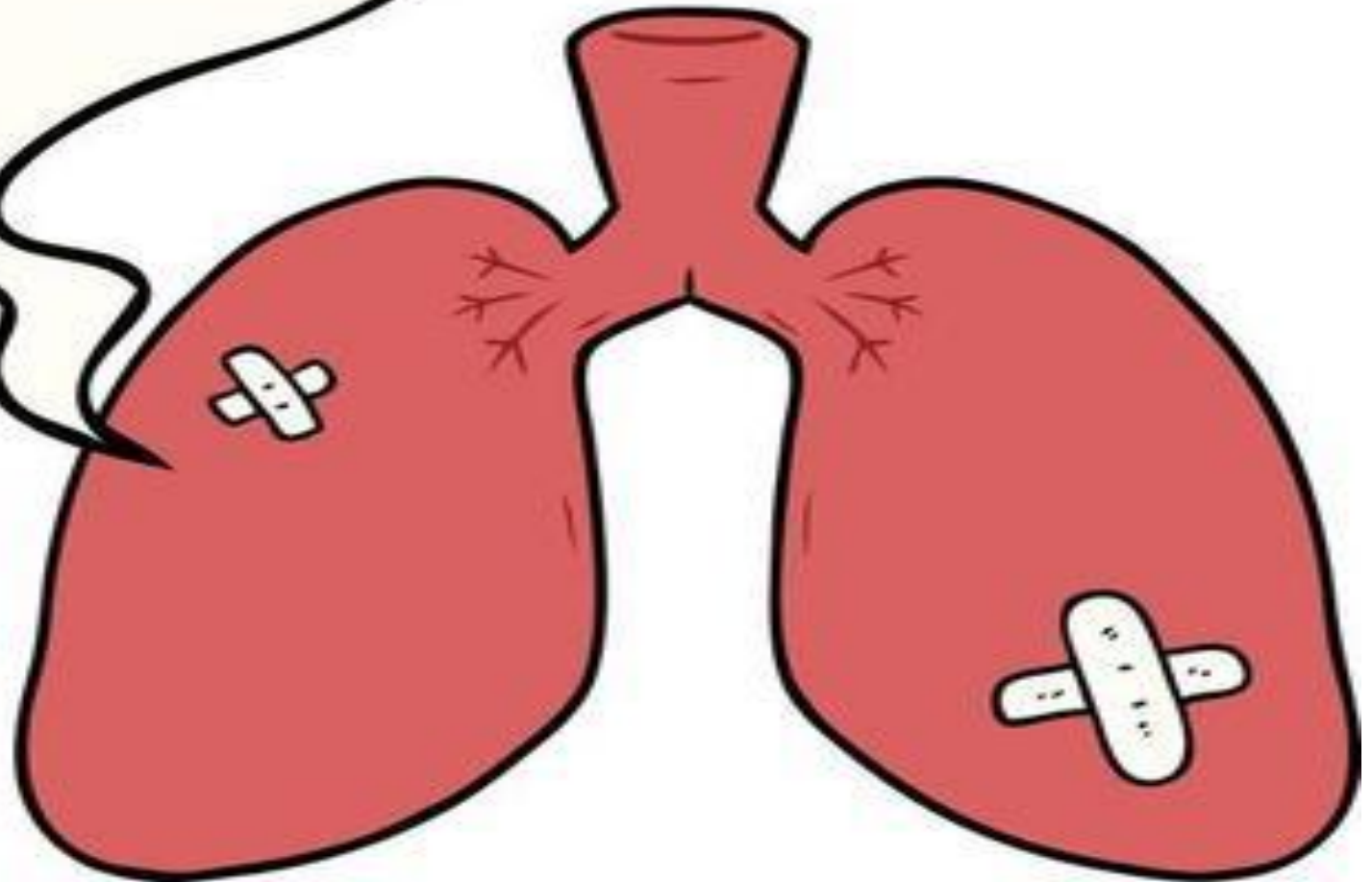
Culture of sputum: on Eaton’s agar “**fried egg**” appearance.



Treatment

- The treatment of choice is either a macrolide, such as erythromycin or azithromycin, or a tetracycline. The fluoroquinolone is also effective.
- Penicillins and cephalosporins are **inactive** because the organism **has no cell wall**.

**LEGIONELLAE
PNEUMOPHILA**



Morphology:

Aerobic G-ve bacilli, stain **faintly** with the standard Gram stain, best stained with **silver stains**.

Cultural characters:

- Can not grow on ordinary media.
- Grow on complex media as **buffered charcoal - yeast extract agar (BCYE)**, special medium supplemented with iron and cysteine.
- Oxidase & Catalase positive.



Virulence factors & Pathogenesis:

- *L. pneumophila* causes **both community and hospital acquired pneumonia.**
- Legionellae are associated chiefly with **environmental water sources** such as air conditioners, hot tubs, and water cooling towers.
- Outbreaks of pneumonia in hospitals been attributed to **inhalation** of aerosols of contaminated air-conditioning systems, sinks, water taps and shower heads.
- Despite airborne transmission, **NO person to person spread.**
- The typical candidate for Legionnaires' disease is **an old man who smokes.**
Patients with chronic lung diseases and **immunocompromised** are also predisposed to *Legionella pneumonia*.

Clinical findings:

Legionnaire's disease (named after the famous outbreak of pneumonia among people attending the American Legion convention in Philadelphia in 1976).

- Fever, chills, malaise, non - productive cough (Atypical pneumonia).
- GIT symptoms like diarrhea and vomiting.
- Neurological symptoms like mental confusion and severe headache.

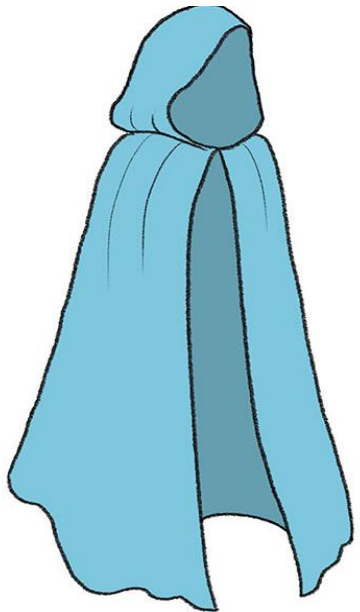
Pontiac fever (named after the city in Michigan that was the site of an outbreak in 1968)

- Mild, flulike form of Legionella infection that does not result in pneumonia.

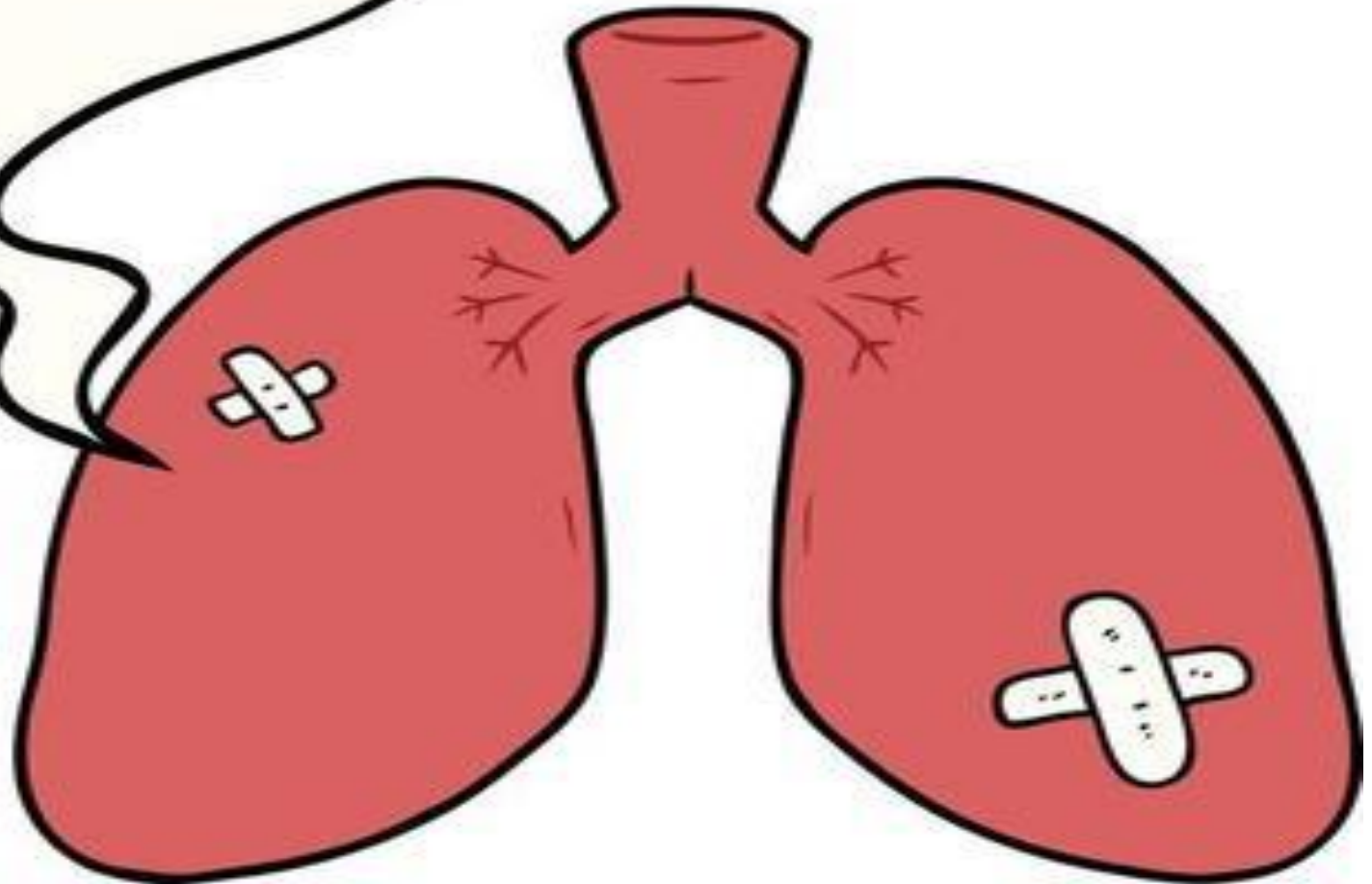
Laboratory diagnosis:

- **Direct fluorescent antibody test (FAT)** of sputum specimen.
- **Urinary antigen test:** Enzyme immunoassay for detection of *L. pneumophila* antigens in the urine is a rapid means of making a diagnosis.
- **Polymerase chain Reaction (PCR)**
- **Culture:** On BCYE agar

CHLAMYDIA

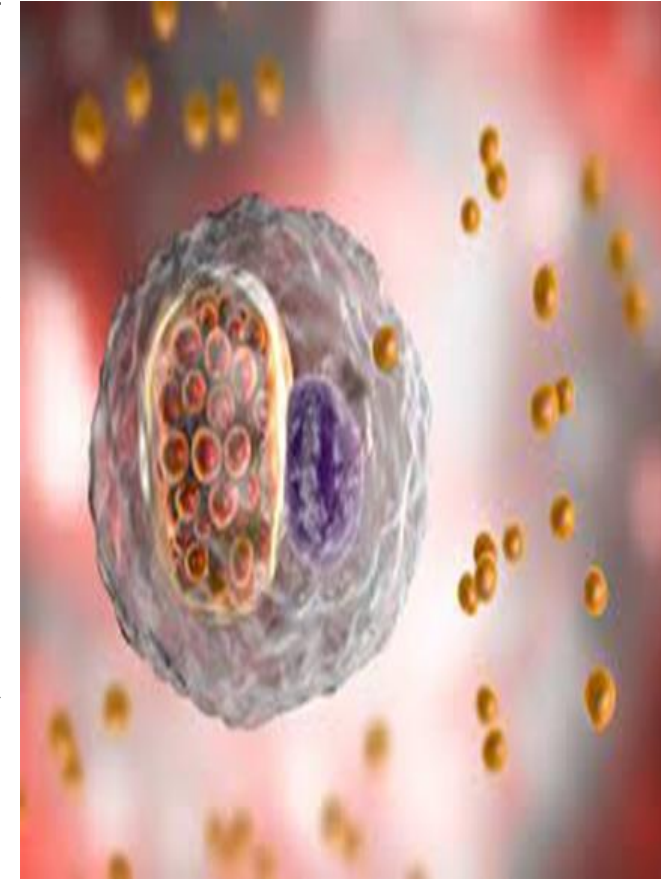


Cloak like



General characters of Chlamydia:

- Chlamydiae are **obligate intracellular** bacteria (i.e., **grow only within living cells**) as it can't synthesize ATP.
- They have a rigid cell wall. Their cell walls **resemble those of gram-negative bacteria but lack muramic acid.**
- Can not stained with gram, best stained with **Giemsa.**
- Chlamydiae have a special replicative cycle, they alternate between two forms, reticulate (infective) and elementary (replicative) bodies, which appear as **intracytoplasmic inclusion body** within the host cell.



Chlamydophila psittaci (Psittacosis)

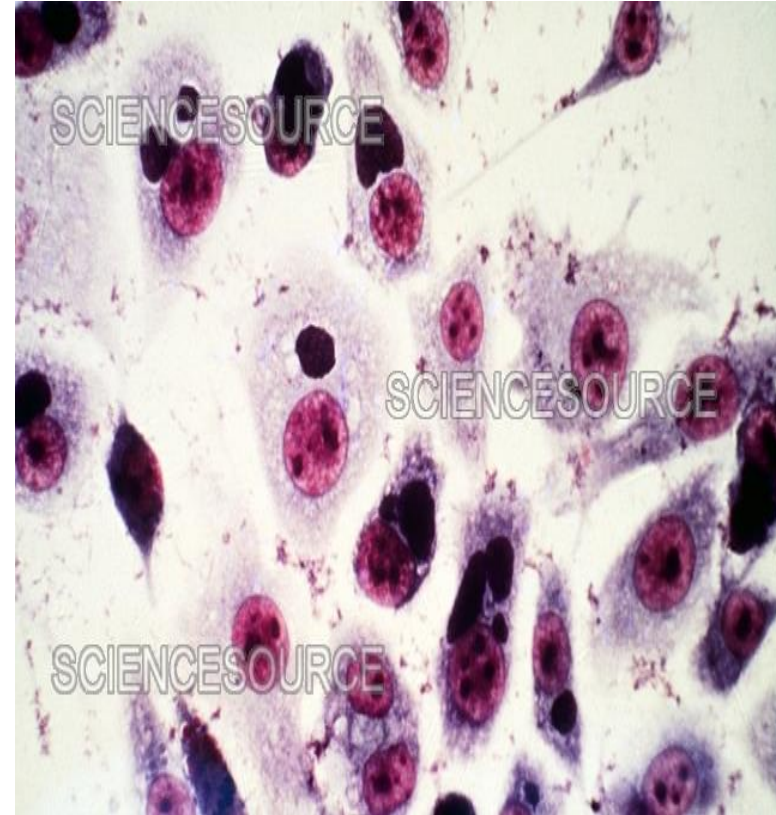
- Psittacosis is a **disease of birds** (e.g., parrots, pigeons, and poultry).
- Man is infected (**Zoonosis**) usually by **inhaling** dust contaminated by **dry bird feces**.
- In human psittacosis, there is **NO person to person transmission**.
- Psittacosis in man occurs usually in the form of bronchopneumonia.

Chlamydophila pneumonia

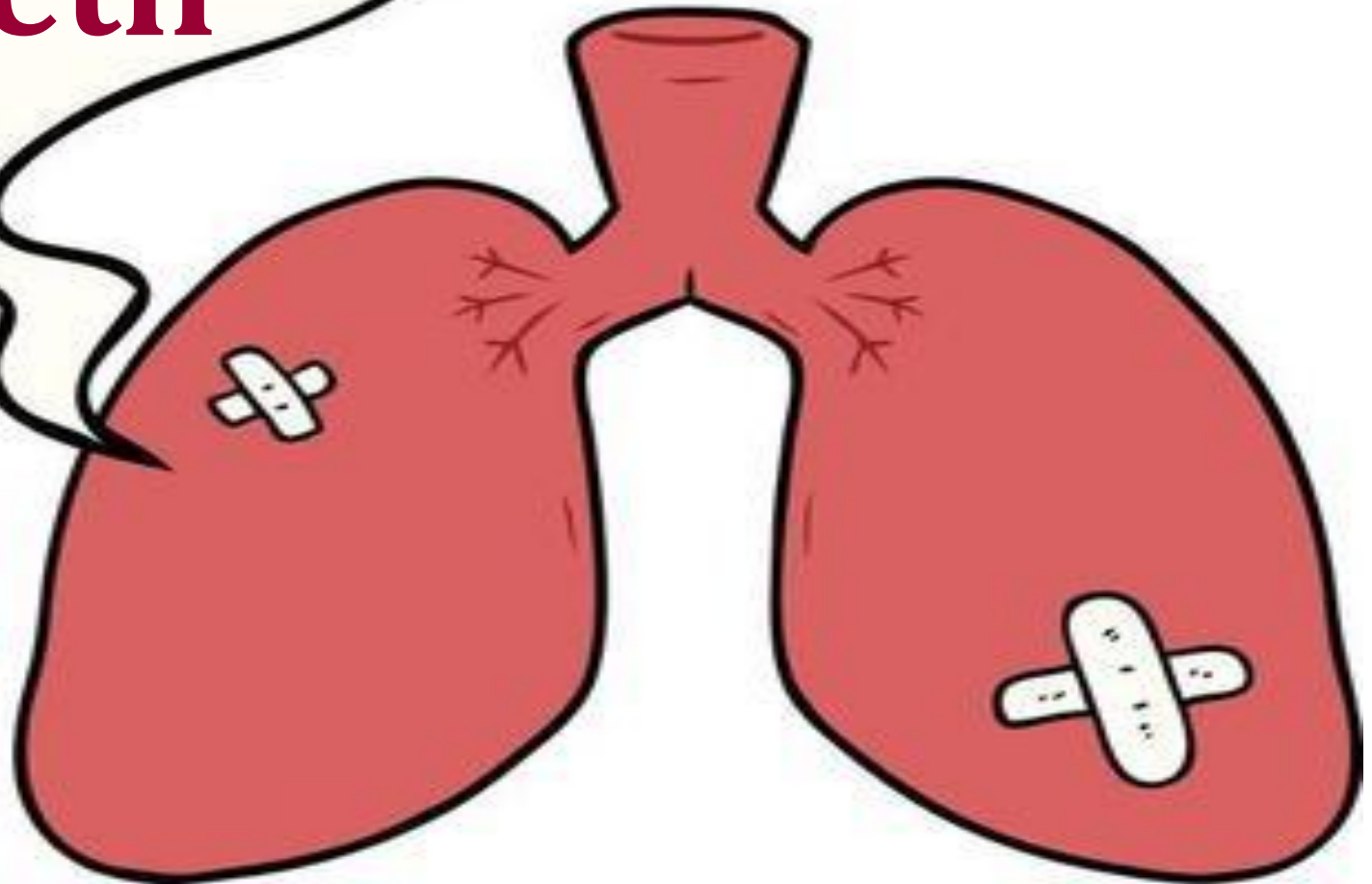
- C. pneumonia infects **only human** and transmitted **from person to person** by **inhalation**.
- It is one of the leading cause of community acquired pneumonia especially in **elderly**. It has recently been associated with atherosclerosis and Alzheimer's disease.

Laboratory diagnosis:

- **Direct fluorescent antibody test (FAT)** of specimen.
- **Culture:** Chlamydiae can be grown in **cell cultures**, **cytoplasmic inclusions** can be seen with special stains (e.g., **Giemsa stain**).
- **Polymerase chain Reaction (PCR)**



**Coxiella
Burnetii**



General characters of *Coxiella burnetii*

One of **Rickettsial** groups, characterized by:

- **Obligate intracellular** organisms, therefore, must be grown in **cell culture**.
- Structurally, their cell wall **resembles that of gram –ve rods**.
- They **stain poorly with Gram stain**, best stained with **Giemsa**.
- Highly resistant to environmental stresses (biological weapon).
- Two antigenic forms, **phase I (virulent) & phase II (avirulent)**.

Q Fever

- The “Q” comes from “query” fever, the name of the disease until its true cause was discovered in the 1930s.
- Q fever is a **zoonosis**. The important reservoirs and sources of human infections are cattle, sheep, and goats.
- *C. burnetii* infections are transmitted by **inhalation of animal aerosols** (especially from urine, feces, placental tissue, and amniotic fluid of the animals) (**Not** transmitted by arthropod bite as other Rickettsia).
- Q fever is usually an **occupational hazard**. People at high risk include farmers, abattoir workers and veterinarians as well as laboratory personnel.

Clinical findings

➤ Acute Q fever: (phase II antigen)

- It begins with fever, headache, cough, and other Influenza like symptoms.
- Pneumonia ensues in about 50 % of patients.
- Hepatitis is frequent enough that the **combination of pneumonia and hepatitis should suggest Q fever.**
- There is **NO rash** (unlike in most of the other rickettsial diseases).

➤ Chronic Q fever: (phase I antigen)

Characterized by chronic cough, intermittent fever, frequent headache and can be complicated with life-threatening **endocarditis.**

Laboratory Diagnosis:

- **Serology:** The **mainstay** of diagnosis. Detection of specific antibodies against phase I & II antigens.
- **PCR.**
- Isolation of the organism: in cell culture is of limited usefulness.

Prevention:

Prevention of Q fever vaccination of occupationally exposed (**killed vaccine**).

*Thank
you*

