

**Obligate intracellular bacteria:**

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Two genera are obligate intracellular ; *Rickettsia* and *Chlamydia*.

- They small rods poorly stained with Gram stain. If stained, are G-ve.
- Obligate intracellular bacteria.
- They can not grow on artificial bacteriologic media.
- They survive for short time outside the host cell.

***Rickettsia* :****Pathogenesis :**

- *Rickettsia* has affinity for vascular endothelial cells located throughout the circulatory system. They enter the host cell by endocytosis into vacuole. When they multiply in endothelium cells lining of small blood vessels of skin, they lead to damage the blood vessels and cause **vasculitis**(vascular lesion). The cells become swollen and necrotic. Damage to vessels of skin results in characteristic rash and in edema and hemorrhage.

**Pathogenicity and clinical features:**

- **Diseases** caused by rickettsia :
  1. **Rocky mountain spotted fever**(RMSF) is caused by *R.rickettsii* ,*R.australis*, and other species. They are transmitted from animal reservoirs (rodent and dogs) to human by tick. invade vascular endothelial cells. After 2-6 days from tick bite , it is causes rash that appears on hands(palms) , feet(soles) and spread rapidly on trunk. symptoms eg Fever ,severe headache, mental confusion (delirium) and coma. DIC, thrombosis and blockage of small blood vessels may be occurring in severe cases. Eschar lesion (thick crust) is exhibit at site of bite in all etiologic agents of spotted fever , except *R.rickettsii*.
  2. **Typhus fever**: there are in several forms ; Epidemic typhus caused by *R.prowazekii* . The organism is transmitted from person to person by human louse bite when the lice excrete the organism in its feces and introduce the pathogen through bite wound of lice into human body. Endemic typhus is caused by *R.typhi*. Scrub typhus is caused by *Orientia tsutsugamushi* (formerly: *R.tsutsugamushi*), Endemic and scrub are transmitted from rodents to human by flea in endemic and by mite in scrub.

Typhus fever appears influenza-like symptoms after 1-2 weeks of arthropod bite. A rash begins on trunk and spread over the entire body. Delirium and coma may occur. Necrotic eschar at site of mite bite may occur.

3. **Q-fever:** is caused by *C.burnetii*. The bacteria contaminate the soil (by animal's feces and urine) and transmitted to human from reservoir animals (cattle sheep, goats) by inhalation of aerosols of animals materials ( urine ,feces , milk ) or dust contaminated with bacteria .Unlike the other rickettsial disease, the main organ involved is the lungs and exhibit influenza-like symptoms; fever, headache and cough, with pneumonia (atypical pneumonia).

**N.B:**

1. All rickettsial diseases are transmitted by arthropod(except Q-fever is transmitted by inhalation).
2. All rickettsial diseases are zoonoses(except epidemic typhus is transmitted from person to person by human body louse).
3. Most cases of spotted fever occur in children during spring and early summer (during warm months) when the ticks are active. Typhus disease is worldwide in area of high infestation with rat ,mite and lice. The Q-fever occurs in individuals whose occupations expose them to livestock animals such as shepherds, farm workers and abattoir employees.

**Lab.Dx:**

- a. Rickettsia do not stain well with gram stain, but they can be visualized in tissue with Giemsa stain.
- b. Rickettsia cannot grow in culture media .They grow readily in yolk sac of embryonated eggs or cell culture or in experimental animals.
- c. Serologically; ELISA and Weil-Felix reaction.

**Control:**

- a. Prophylaxis :
  1. Control on vectors by using insect repellent or insecticide.
  2. Elimination of rodents from households and surroundings.
  3. Vaccine effective is available for Q-fever and typhus fever, not for RMSF.
- b. Antibiotic: drug of choice is tetracycline. Chloramphenicol can be used as second choice.

## *Chlamydia:*

### **Pathogenesis :**

Chlamydia have life cycle different from that of all other bacteria . They have 2 forms during their replication cycle.

The cycle begins by small **elementary body** (EB) metabolically inert when the organism is found extracellular(outside the cell). The EB adhere and enters the epithelial cell of host by endocytosis, and inhibit fusion of phagosome with lysosome, then the EB reorganizes into a larger , metabolically active form **reticulate body** (RB) when it intracellular. The later form undergoes repeated binary fission to produce large numbers of new EBs, which are released from the cell by cytolysis, ending in host cell death. The development cycle takes 24-48 hr.

Pathogenicity of Chlamydia dependent on

- a. Ability of Chlamydia to prevent fusion of lysosome with phagosome.
- b. Production of endotoxin.

### **Pathogenicity and clinical findings:**

• *C.trachomatis* cause the following diseases :

1. **Eye infection** (trachoma): *C.trachomatis* infects only humans and is transmitted by finger or fomite to eye contact. trachoma begins with acute inflammatory of conjunctiva and cornea. Reinfection produce corneal scarring and conjunctival deformity, and may be leading cause blindness.
2. **Genital infection(venereal disease)**; *C.trachomatis* is transmitted either by sexual contact among young adult who sexually active(STD) , or transmitted by through the birth duct . In men , it is cause urethritis , the patient has dysuria and purulent urethral discharge. The disease may progress to epididymitis, prostatitis or proctitis. In women, urethritis , cervicitis, and progress to salpingitis. Repeated infection can result infertility or ectopic pregnancy.
3. **Reiter syndrome** is characterized by urethritis , arthritis and uveitis. The syndrome is autoimmune disease caused by antibodies formed against *C.trachomatis* cross-reacting with antigens on cell of urethra, joints and uveal tract. This syndrome may also be occur following infection of *Shigella*, *Salmonella*, *Campylobacter*, *Yersinia*.

• *C.pneumoniae* causes upper and lower respiratory tract infection, especially pharyngitis and pneumonia (**atypical pneumonia** ).

*C.pneumoniae* infects only humans and is transmitted from person to person by aerosol (air droplets) .

Atypical pneumonia may caused by other organisms such as *Mycoplasma pneumoniae* , *Legionella pneumophilla* , *Coxiella burnetii*.

**Lab.Dx:**

- a. Chlamydia can be seen by light microscope when the cell stained with Giemsa.
- b. Chlamydia can be grown in cell culture ,also can be grow in yolk sac of embryonated chicken eggs .
- c. Serologic tests : ELISA, CFT.

**Control:**

1. Prophylaxis:
  1. Personal hygiene.
  2. Safe sexual behavior.
  3. No vaccine available.
2. Antibiotic treatment: Tetracycline, erythromycin.