8.10A: Chlamydiae

Chlamydiae are a bacterial phylum and class whose members are obligate intracellular pathogens.

LEARNING OBJECTIVES

Discuss the evidence that supports Chlamydiae as a unique bacterial evolutionary group

KEY TAKEAWAYS

Key Points

- Chlamydiae replicate inside the host cells and are termed intracellular.
- Most intracellular chlamydiae are located in an inclusion body or vacuole.
- Chlamydiae is a unique bacterial evolutionary group that separated from other bacteria approximately a billion years ago. It falls into the clade Planctobacteria in the larger clade Gracilicutes.
- Chlamydia infection is a common sexually transmitted infection (STI) in humans caused by the bacterium Chlamydia trachomatis.
Key Terms

- **chlamydiae**: Chlamydiae is a bacterial phylum and class whose members are obligate intracellular pathogens.
- **inclusion body**: Inclusion bodies are nuclear or cytoplasmic aggregates of stainable substances, usually proteins.

Chlamydiae are a bacterial phylum and class whose members are obligate intracellular pathogens. Many chlamydiae coexist in an asymptomatic state within specific hosts. It is widely believed that these hosts provide a natural reservoir for these species. All known chlamydiae only grow by infecting eukaryotic host cells. They are as small or smaller than many viruses.

Chlamydiae replicate inside the host cells and are termed intracellular. Most intracellular chlamydiae are located in an inclusion body or vacuole. Outside of cells they survive only as an extracellular infectious form. Chlamydiae can only grow where their host cells grow. Therefore, chlamydiae cannot be propagated in bacterial culture media in the clinical laboratory. Chlamydiae are most successfully isolated while still inside their host cell.

Chlamydiae is a unique bacterial evolutionary group that separated from other bacteria approximately a billion years ago. Cavalier-Smith has postulated that the Chlamydiae fall into the clade Planctobacteria in the larger clade Gracilicutes. The species from this group can be distinguished from all other bacteria by the presence of conserved indels in a number of proteins such as RNA polymerase alpha subunit, Gyrase B, Elongation factor-Tu and Elongation factor-P, and by large numbers of signature proteins that are uniquely present in different chlamydiae species. Reports have varied as to whether Chlamydiae is related to Planctomycetales or Spirochaetes. However, genome sequencing indicates that 11% of the genes in Candidatus Protochlamydia amoeobophila UWE25 and 4% in Chlamydiaceae are most similar to chloroplast, plant, and cyanobacterial genes. Phylogeny and shared presence of conserved indels in proteins such as RNA polymerase Beta subunit and Iysyl-tRNA synthetase indicate that Verrucomicrobia are the closest free-living relatives of these parasitic organisms.

There are three described species of chlamydiae that commonly infect humans:

1. **Chlamydia trachomatis**, which causes the eye-disease trachoma and the sexually transmitted infection chlamydia.
2. **Chlamydia pneumoniae**, which causes a form of pneumonia.
3. **Chlamydia psittaci**, which causes psittacosis.

Chlamydia infection is a common sexually transmitted infection (STI) in humans caused by the bacterium Chlamydia trachomatis. The term Chlamydia infection can also refer to infection caused by any species belonging to the bacterial family Chlamydiaceae. C. trachomatis is found only in humans. Chlamydia is a major cause of blindness today, especially in developing countries.

Risk factors include a history of chlamydial or other sexually transmitted infection, new or multiple sexual partners, and inconsistent condom use. C. trachomatis infection can be effectively cured with antibiotics once it is detected. Current
guidelines recommend: azithromycin, doxycycline, erythromycin, or ofloxacin. Agents recommended for pregnant women include erythromycin or amoxicillin.

Chlamydia bacteria group: Light microscope view of cells infected with chlamydiae as shown by the brown inclusion bodies.