

# CHLAMYDIA & CHLAMYDOPHILA

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# General Characteristics

- Chlamydiae are ***obligate intracellular bacteria***.
- *Have DNA, RNA and ribosomes, but lack ability to synthesize ATPs.*
- ***Cytochemically Gram Negative.***  
*(Stains with Modified ZN stain, Giemsa, Macchiavello or Castaneda stains)*
- Replicate within cytoplasmic vacuoles in host cells.
- Exhibit unusual ***biphasic developmental cycle***.
- They cannot synthesize their own ATP, thus termed as ***“Energy Parasite”***.

# Habitat

- **Cannot survive outside host for long**
- **Gastrointestinal tract appears to be the usual site of *Chlamydophila* species.**
- **Intestinal infections are often subclinical and persistent.**
- **Faecal shedding of the organisms, which is typically prolonged, becomes intermittent with time.**
- **They also colonise reproductive tract.**

# Classification

Order	Family	Genera	Important Species
Chlamydiales	Chlamydiaceae	Chlamydia	<i>Chlamydia trachomatis</i>
		Chlamydophila	<i>Chlamydophila psittaci</i> <i>Chlamydophila abortus</i> <i>Chlamydophila felis</i> <i>Chlamydophila pecorum</i>

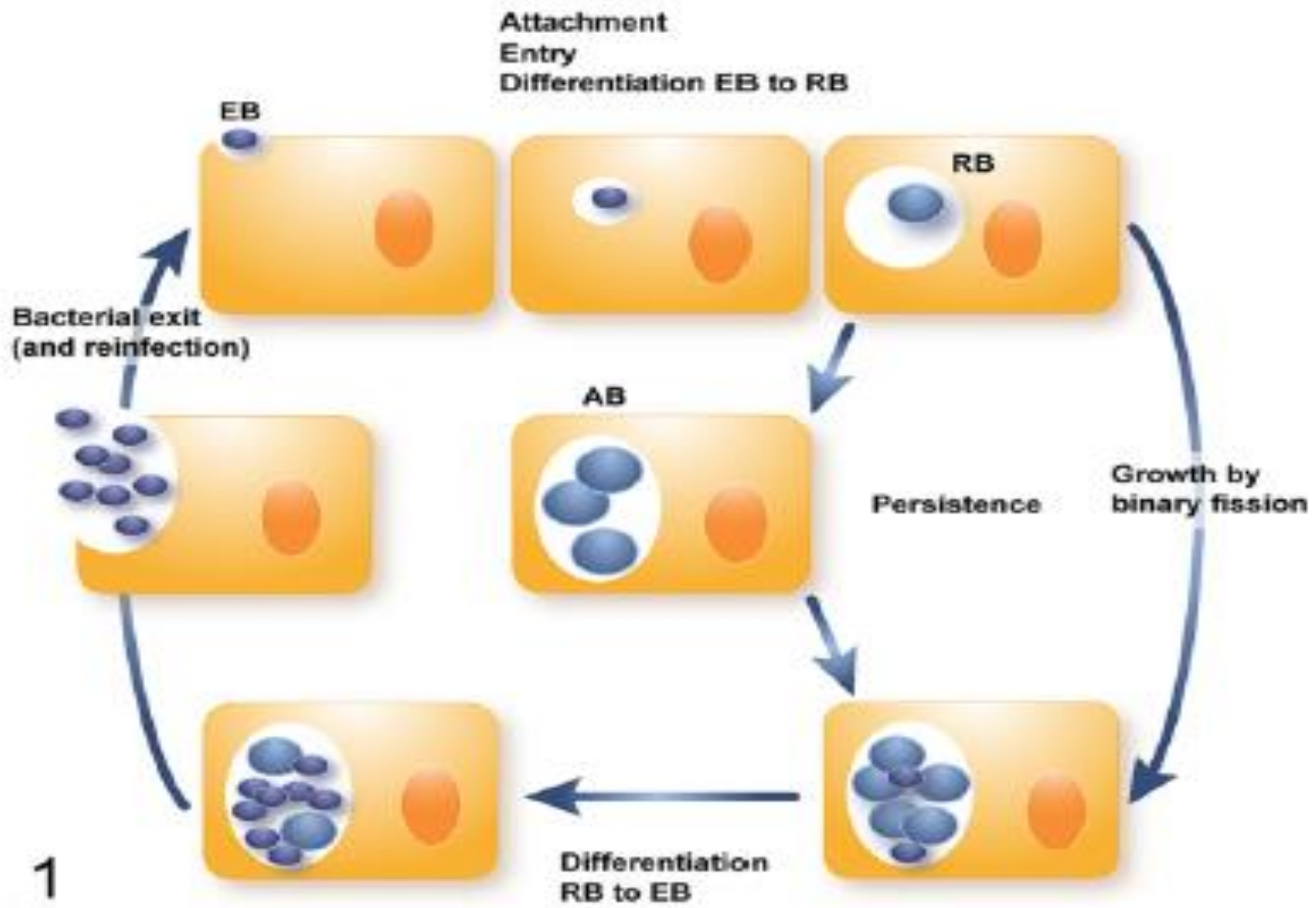
Agent	Disease
<i>Chlamydophila psittaci</i>	Avian Chlamydiosis
<i>Chlamydophila abortus</i>	Enzootic abortion of Ewe
<i>Chlamydophila felis</i>	Feline Chlamydiosis
<i>Chlamydophila pecorum</i>	Sporadic bovine encephalomyelitis

# Unique Biphasic Developmental Cycle in Chlamydia

- *Infectious and reproductive* forms are morphologically distinct.
- Infectious extracellular forms, called *elementary bodies (EBs)*
- *The reproductive form is called “Reticulate bodies (RBs)”*
- Elementary bodies enter host cells by receptor-mediated endocytosis.
- Acidification of the endosome and fusion with lysosomes are prevented by mechanisms which are not fully understood.

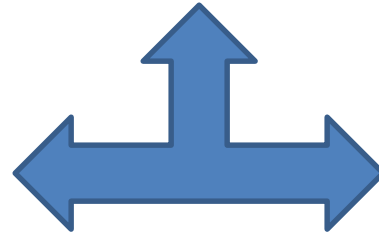
# Developmental Cycle in Chlamydia

- Structural reorganization - conversion of an *Elementary Body (EB)* into a *reticulate body (RB)*.
- The RB, about 1µm in diameter, *replicates by binary fission* within the endosome.
- RBs continuing to divide while others condense and mature to form EBs.
- The endosome and its contents, when stained, is called *an inclusion*.
- Replication continues for up to **72** hours - after infection when the host cell lyses releasing - EBs and RBs.



# Chlamydial developmental stages

Elementary Body



Reticulate body

- Infectious extracellular forms,
- ***Small (200 to 300 nm),***
- *Metabolically inert and*
- *Osmotically stable.*
- Can survive in environment for a few days

- Reproductive form
- Size:- about 1µm in diameter,
- Metabolically active,
- Osmotically fragile, and

***replicates by binary fission***  
within the endosome



# Pathogenesis

- Has worldwide occurrence.
- Chlamydiae affects wide range of hosts, diseases, and tissues
- Clinical conditions ranges from inapparent subclinical to serious life threatening infections.
- Chlamydia causes ***Ornithosis / Psittacosis*** in birds.
- Clinical conditions associated with chlamydial infections in mammals are ***abortion and conjunctivitis, encephalomyelitis and polyarthrits***.
- *C. trachomatis* remains the leading cause of sexually transmitted infections and trachoma in human.

# Avian Chlamydiosis

- The disease has been recorded worldwide.
- **Psittacosis:-** Infections with *C. psittaci* in psittacine birds
- **Ornithosis:** Chlamydial infection in other avian species.
- **Avian chlamydiosis-** Term now in use.
- Organism is present in **respiratory discharges and faeces** of infected birds.
- Infection is usually acquired by **inhalation** or by **ingestion**. Subclinical infection is common.
- Clinically affected and carrier birds –Shed organism
- Stress is important in precipitating disease outbreaks

# Clinical signs:

- *Avian chlamydiosis is a generalized infection, affecting particularly the **digestive and respiratory tracts**.*
- The incubation period is up to 10 days.
- Clinical signs vary in nature and severity, depending on the strain of *C. psittaci* and the species and age of the affected birds.
- Signs include ***loss of condition, nasal and ocular discharges, diarrhoea and respiratory distress***.
- The most frequent post- mortem findings are hepatosplenomegaly, airsacculitis and peritonitis.

# Enzootic abortion of ewes

- Enzootic abortion of ewes (EAE) caused by ***C. abortus***
- The disease is economically significant in most sheep producing countries.
- Abortion associated with ***C. abortus*** is best documented in sheep.
- Chlamydial infection in cattle and goats often originates from sheep.

# Enzootic abortion of ewes

- Large numbers of *chlamydiae* are shed in *placentas and uterine discharges* from affected ewes.
- *Infection occurs by ingestion.*
  - Infection early in pregnancy can result in abortion during that pregnancy.
  - Ewes infected late in pregnancy do not usually abort but may do so in the next pregnancy.
  - Ewe lambs may acquire infection during the neonatal period and abort during their first pregnancy.

# Enzootic abortion of ewes

- EAE is characterized by abortion during **late pregnancy**
- **Necrosis of cotyledons** and **oedema of adjacent inter-cotyledonary tissue** in affected placentas
- *Aborting ewes rarely show evidence of clinical disease and their subsequent fertility is usually unimpaired.*
- Although up to 30% of animals in a fully susceptible flock may abort, a rate of **5** to **10%** is more usual in endemic flocks.

# EAE- Diagnosis

- Well-preserved aborted lambs and ***evidence of necrotic placentitis*** are suggestive of **EAE**.
- Large numbers of EBs can be demonstrated in placental smears using suitable staining procedures.
- Isolation of chlamydiae in suitable cell lines or in embryonated eggs
- PCR- NAATs
- CFT, ELISA and indirect immunofluorescence.

# Feline Chlamydiosis

- *Chlamydophila felis* causes conjunctivitis and less commonly rhinitis.
- Infection is transmitted by direct or indirect contact with conjunctival or nasal secretions.
- Organisms may also be shed from the reproductive tract
- ***Unilateral or bilateral conjunctival congestion, clear ocular discharge***



# Sporadic bovine encephalomyelitis

- This neurological disease, caused by *C. pecorum*
- ***Intestinal infection*** in cattle with *C. pecorum* is common, sporadic bovine encephalomyelitis occurs
- Affected animals, which are usually under **3** years of age
- ***High fever and exhibit incoordination, depression, excessive salivation and diarrhoea.***
- Terminally animals ***may become recumbent and can develop opisthotonos.***
- The course of the disease is about 2 weeks, and the mortality rate may be up to **50%**.

# Diagnostic procedures

- History, clinical signs and pathological changes suggest certain chlamydial infections
- Smears or histological sections of organs from ***aborted foetuses*** or from the liver and
- ***Spleen in cases of avian chlamydiosis*** are suitable for direct examination.
- Placental smears from cases of chlamydial abortion typically contain large numbers of organisms.

# Diagnosis

- Organisms may be identified in stained impression smears of affected tissues.
- Isolation of *C. psittaci* is carried out in embryonated eggs or in cell culture.
- Egg inoculation is done through yolk sac route.
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- Cell lines such as McCoy, **L929**, baby hamster kidney and Vero are used.
- Antibodies to *C. psittaci* may be detected using CFT and ELISA.
- Chlamydial DNA may be demonstrated by the PCR.

# Human infection

- Infection through aerosol, ingestion or sexual contact
- *Chlamydia trachomatis* causes Trachoma,
- Conjunctival epithelial cells subepithelial infiltration of lymphocytes, follicle development, corneal opacity.
- *Chlamydia trachomatis* also causes sexually transmitted genital and rectal infections.
- Acute salpingitis and cervicitis in young women

# Human infection

- Fever, a mild influenza like disease, or toxic fulminating pneumonitis
- *Pulmonary involvement* is common.
- *Meningitis or meningoencephalitis*
- *lymphogranuloma venereum*, a venereal disease with genital lesions and regional lymph node involvement

**THANKS**