# Chlamydia / Chlamydophila species

## **1. Taxonomy & Classification**

* **Domain**: Bacteria
* **Family**: *Chlamydiaceae*
* **Genus**: Historically split into *Chlamydia* and *Chlamydophila*; recent phylogeny supports single genus *Chlamydia*, but both names still appear in literature and guidelines.
* **Clinically important species**:
  + *Chlamydia trachomatis* – human pathogen only
  + *Chlamydia pneumoniae* (formerly *Chlamydophila pneumoniae*)
  + *Chlamydia psittaci* (formerly *Chlamydophila psittaci*)
  + *Chlamydia abortus* – zoonotic, causes ovine/caprine abortion; risk of severe febrile illness with fetal loss in pregnant women
  + Rarer: *C. felis*, *C. pecorum*

## **2. General Microbiology & Laboratory Features**

### **A) Morphology & Gram**

* Very small (0.2–1.5 μm), **Gram-negative-like** envelope but no true peptidoglycan layer; cysteine-rich proteins provide structural stability in EB form.
* Obligate intracellular parasites — cannot be grown on artificial media.
* Energy parasites — depend on host ATP.
* **Growth:** Require living cells (e.g., McCoy, HeLa, Hep-2) or embryonated eggs.

### **D) Staining**

* Gram stain not useful.
* **Giemsa**: intracytoplasmic inclusions.
* **Immunofluorescence**: genus- or species-specific MOMP antigens.

### **E) Antigenic Structure**

* **MOMP** (ompA) — species/serovar-specific, used in typing.
* LPS — genus-specific.

## **3. Laboratory Diagnosis**

### **Direct detection**

* **NAATs** — first-line for *C. trachomatis* (urine, vulvovaginal, endocervical, rectal, pharyngeal samples).
* **PCR/RT-PCR** for *C. pneumoniae* and *C. psittaci* from respiratory or tissue samples.
* **Cell culture** — gold standard for legal/forensic confirmation (child sexual abuse).
* **Antigen detection** — DFA, EIA; largely replaced by NAATs.
  + DFA staining of EBs in clinical specimens still used for ocular/trachoma field surveys.

### **Serology**

* *C. psittaci*: complement fixation test (CFT) still used in UK; microimmunofluorescence (MIF) is gold standard.
* *C. pneumoniae*: MIF is reference; requires paired sera; cross-reactivity with other chlamydiae possible.
* *C. trachomatis*: serology not useful for acute genital infection; IgG ELISA sometimes used in infertility workup.

## **5. Antimicrobial Susceptibility**

* No routine AST in clinical labs — requires intracellular culture.
* Naturally resistant to β-lactams (no peptidoglycan in EB form); β-lactams may induce persistence without killing.
* Susceptible to tetracyclines, macrolides, and fluoroquinolones.
* Rare macrolide resistance (23S rRNA mutations) and tetracycline resistance (tet genes) reported.

## **6. Biosafety**

* *C. trachomatis*, *C. pneumoniae* — Hazard Group 2 (BSL-2).
* *C. psittaci* — Hazard Group 3 (BSL-3 containment for culture) due to high aerosol transmissibility.

## **7. Clinical Microbiology – Species-Specific**

### **A) *C. trachomatis***

* **Biovars/serovars**:
  + Trachoma biovar: A, B, Ba, C → chronic follicular conjunctivitis → blindness.
  + Genital biovar:
    - D–K → urogenital infections (NGU, cervicitis, PID, epididymitis, prostatitis, conjunctivitis, neonatal pneumonia).
    - L1, L2, L2a, L3 → LGV (invasive STI, proctocolitis, buboes).
* **Complications**: PID, infertility, ectopic pregnancy, chronic pelvic pain, reactive arthritis.

### **B) *C. pneumoniae***

* Human-only pathogen, respiratory transmission.
* Atypical pneumonia, bronchitis, pharyngitis, sinusitis.
* Often mild/subclinical; high adult seroprevalence.

### **C) *C. psittaci***

* Zoonotic (birds: parrots, pigeons, poultry).
* **Psittacosis**: atypical pneumonia ± systemic features (fever, headache, hepatosplenomegaly, rash).
* Severe cases: myocarditis, hepatitis, encephalitis.

### **D) *C. abortus***

* Zoonotic from sheep/goats; causes ovine/caprine abortion.
* In pregnant women: severe febrile illness, hepatitis, DIC, high risk of fetal loss.
* Exposure risk: handling birth products.

## **8. Treatment**

C. trachomatis (urogenital): First-line: Doxycycline 100 mg bd × 7 days.

LGV: Doxycycline 100 mg bd × 21 days.

Trachoma :Azithromycin 20 mg/kg single dose (mass drug administration).

C. pneumoniae & C. psittaci: Doxycycline 100 mg bd × 10–14 days; alternatives: macrolides, levofloxacin.

C. abortus: Doxycycline; avoid exposure in pregnancy (treatment is largely supportive in severe cases).

## **9. Prevention & Control**

* *C. trachomatis*: opportunistic NAAT screening in <25s, partner notification/treatment.
* *C. psittaci*: control bird infection, PPE, zoonosis reporting.
* *C. abortus*: PPE, avoid pregnant women handling lambing ewes/goats, veterinary control measures.