

Chlamydia and Gardnerella

Urogenital Tract Module

Microbiology lecture 2

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Outline

- Chlamydia
 - General characteristics
 - Classification
 - Chlamydia life cycle
 - Genitourinary chlamydia infection: presentation, diagnosis, and treatment.
 - Lymphogranuloma venereum: presentation, diagnosis, and treatment.
 - Infant pneumonia due to Chlamydia trachomatis
- Infectious Vulvovaginitis (*Gardnerella vaginalis*)

Chlamydia

Chlamydia: General characteristics

- **Gram-negative–like** coccobacilli
 - Structurally, Chlamydia has a Gram-negative–like cell wall (with an inner and outer membrane but **lacking a classic peptidoglycan** layer).
 - Morphologically, they are very small coccobacilli (0.25 to 0.3 μm in diameter).
 - In Gram staining, they typically do not stain well
 - Absent peptidoglycan in the cell wall, which makes beta-lactam antibiotics ineffective.
 - Visible as cytoplasmic inclusion bodies on Giemsa stain or fluorescent antibody-stained smear

Chlamydia: General characteristics

- **Obligate intracellular**

WHY they are obligate intracellular?

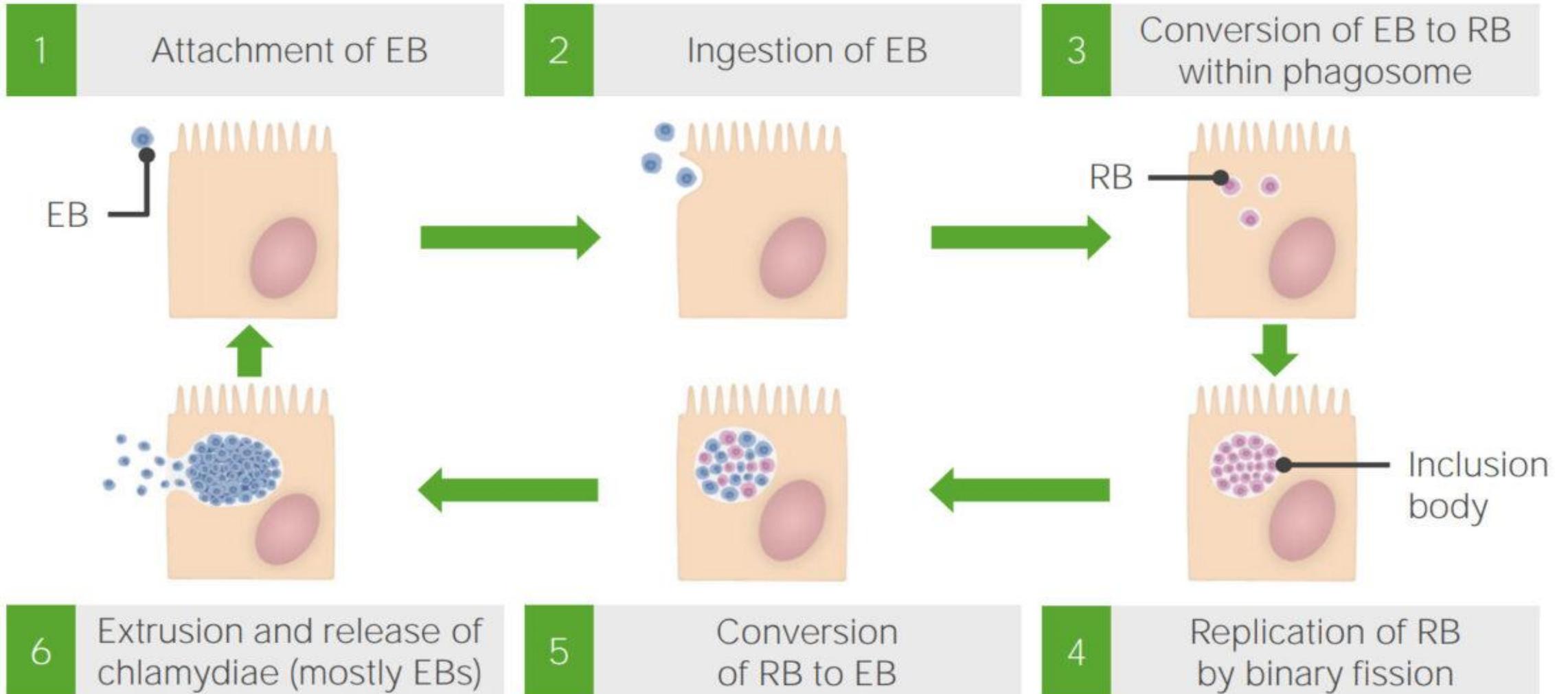


Its unable to produce its own ATP → Sometimes its called "**energy parasites**" because they steal ATP (and other metabolites) from the host cell they infect.



Very difficult cultivation

Chlamydia: Chlamydia life cycle



Chlamydia: Chlamydia life cycle- Mnemonic



Elementary bodies survive in the **E**nvironment, **E**nter the cell via **E**ndocytosis, and **E**volve into reticulate bodies.



Reticulate bodies **R**eplicate in the cell and **R**eorganize to elementary bodies.

Chlamydia: Chlamydia life cycle

- **First phase:** elementary bodies (small and dense bodies that characterize the infectious stage of Chlamydiaceae; stable in the extracellular environment and almost inactive metabolically).
 1. Attachment of extracellular elementary bodies to target cells (mostly on the respiratory or urogenital epithelium)
 2. Endocytosis
 3. Transformation into reticulate bodies in the endosome

Chlamydia: Chlamydia life cycle

- **Second phase:** reticulate bodies (represent the obligate intracellular, replicative, and metabolically active form of Chlamydiaceae)
4. Replication by fission and aggregation of various reticulate bodies in the endosome (at which point they are called inclusion bodies)
 5. Transformation of reticulate bodies into elementary bodies
 6. Lysis of endosomes
 7. Release of newly formed elementary bodies and exit from cell
 8. New start of cycle

Chlamydia: Classification

- Chlamydiaceae is a family of gram-negative coccobacilli, obligate intracellular bacteria that includes 3 organisms pathogenic to humans:
 - *Chlamydia trachomatis* (15 serovars)
 - *Chlamydophila pneumoniae*
 - *Chlamydophila psittaci*

Chlamydia: *C. trachomatis* Classification

Serovars
(A, B, C)



Trachoma

Serovars
(D to K)



Chlamydial genitourinary
infections

Neonatal infections:

- Neonatal conjunctivitis
- Infant pneumonia

Serovars
(L1, L2, L3)



Lymphogranuloma
venereum

Chlamydia: Genitourinary chlamydia

- Known also as **Non-lymphogranuloma venereum**
- **Etiology:** *Chlamydia trachomatis* serotypes D–K
- **Transmission:** May be transmitted through genital-to-genital contact.
- **Epidemiology:** One of the most common sexual transmitted infections (STIs) in the US. One of the most common causes of pelvic inflammatory disease

Chlamydia: Genitourinary chlamydia- Clinical Presentation

- **In women:** Often asymptomatic
 - Cervicitis
 - Urethritis
 - Salpingitis
 - Pelvic inflammatory disease (PID)
 - Symptoms include mucopurulent discharge, dysuria, and pyuria, Dyspareunia, Postcoital bleeding
- **In men:** Urethritis, Epididymitis, Proctitis

Chlamydia: Genitourinary chlamydia- Diagnosis

- Preferred test: Nucleic Acid Amplification Test (NAAT). It detects *Chlamydia trachomatis* RNA or DNA, e.g., by PCR.
- Specimen collection:
 - In females: vaginal swab (preferred), cervical swab, or first-void urine.
 - In males: first-void urine (preferred) or urethral swab.

Chlamydia: Genitourinary chlamydia- Treatment

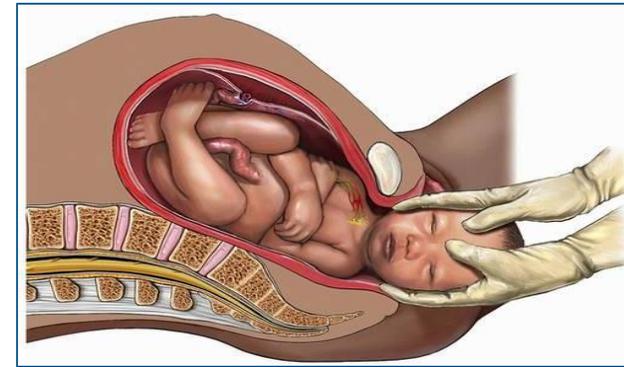
- Start antibiotic therapy (even if asymptomatic), e.g., doxycycline or azithromycin.
- Evaluate and treat partners.
- Test for common sexually transmitted coinfections. All patients: HIV testing, gonorrhoea testing, syphilis testing
- Report all cases of genitourinary chlamydia to the local health department.

Chlamydia: Genitourinary chlamydia- Complications

- Pelvic inflammatory disease Ectopic pregnancy
- Infertility
- Reactive arthritis: reactive arthritis triad (RAT):
 - Arthritis, urethritis, and uveitis or conjunctivitis
 - More common in men

Chlamydia: Neonatal infections

- Neonatal infections (serovars D–K)
- Neonatal conjunctivitis:
 - Occurs 2–30 days following birth
 - Causes eyelid swelling, hyperaemia, and purulent discharge
 - Can lead to conjunctival scarring and corneal vascularization
 - Prevention: routine topical erythromycin after birth



Chlamydia: Neonatal infections

- **Infant pneumonia** (atypical pneumonia):
 - Occurs 2–3 weeks after birth
 - Causes diffuse interstitial pneumonia if untreated
- **Transmission:** perinatal transmission during delivery via contact with the genital flora of an infected mother.
- **Prevention:** maternal screening and treatment before birth
- **Treatment:** erythromycin, azithromycin

Chlamydia: *Lymphogranuloma venereum*

- Etiology: Caused by *Chlamydia trachomatis* serotypes L1–L3
- Epidemiology: Globally: more common in tropical and subtropical regions.

Chlamydia: *Lymphogranuloma venereum*- Clinical presentation

- Rectal infection (most common): proctitis or proctocolitis
 - ~ 50% of cases may be asymptomatic or mild.
 - Mild symptoms: constipation, mucous streaking of stool.
 - Severe symptoms: rectal pain, bleeding, and discharge; tenesmus, and systemic symptoms.

Chlamydia: *Lymphogranuloma venereum*- Clinical presentation

- Genital or anal infection: genital and inguinal disease:
 - Primary infection (after approx. 1 week): **Small, painless genital ulcers** that heal spontaneously within a few days. May be accompanied by mucopurulent discharge.
 - Secondary infection (2–6 weeks after onset of primary infection): **Painful** swelling of the **lymph nodes** in the inguinal region.

Chlamydia: *Lymphogranuloma venereum*- Diagnosis

- Genotyping (e.g., by PCR) of sample taken for NAAT to identify the *C. trachomatis* serotypes associated with LGV.
- If clinical suspicion for LGV is high, start antibiotic treatment immediately rather than waiting for the results of diagnostic testing.

Chlamydia: *Lymphogranuloma venereum*- Treatment

- Start antibiotic therapy (preferably doxycycline).
- Evaluate and treat the partner.
- Testing for common sexually transmitted coinfections is recommended: HIV testing, gonorrhoea testing, syphilis testing.
- Report all cases of LGV to the local health department.

Infectious Vulvovaginitis (*Gardnerella vaginalis*)

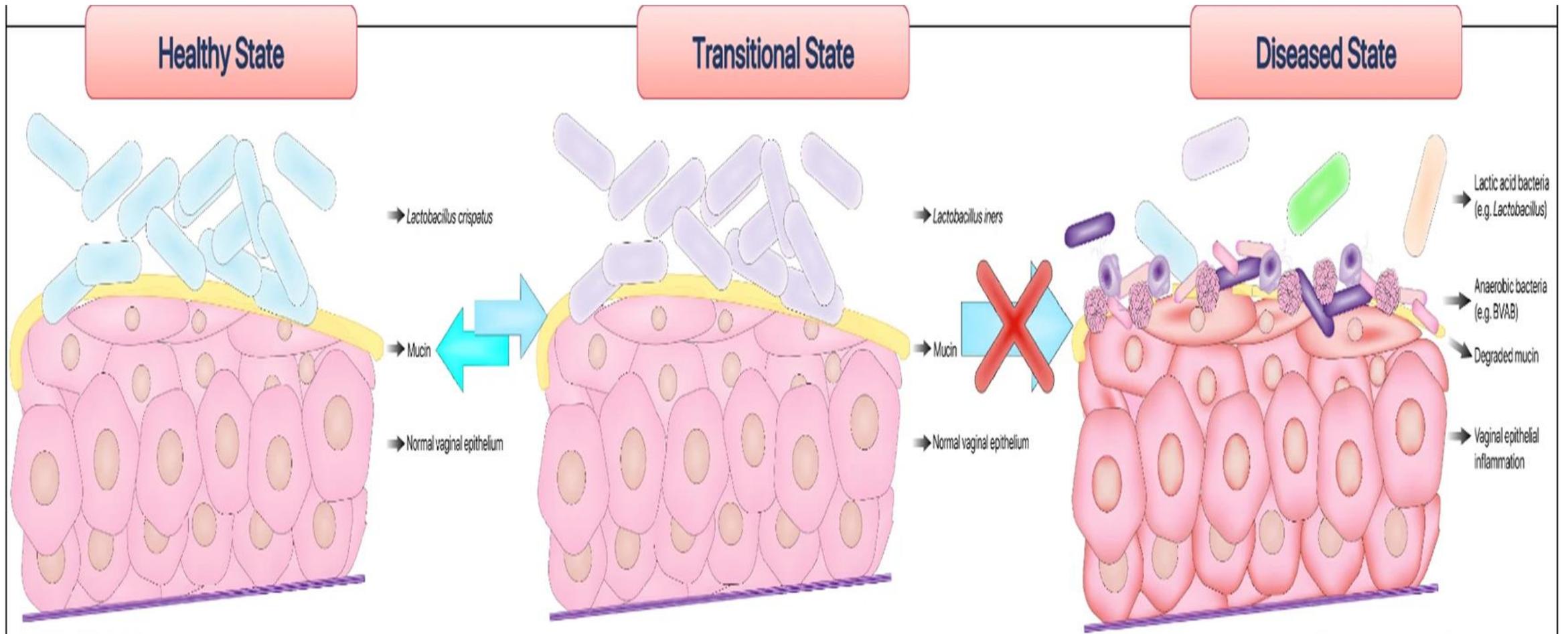
Infectious Vulvovaginitis: Introduction

- Vulvovaginitis refers to a large variety of conditions that result in inflammation of the **vulva** and **vagina**.
- The causes may be **infectious** (e.g., bacterial vaginosis in most cases) or **non-infectious** such as allergic vulvovaginitis, and genitourinary syndrome of menopause.

Infectious Vulvovaginitis: Pathophysiology

- Physiologically, the normal vaginal flora (mainly **lactobacilli**) keeps the **pH** levels of the vaginal fluids **low** → thus preventing the overgrowth of pathogenic and opportunistic organisms.
- Disruption of that flora (e.g., due to sexual intercourse) predisposes to infection and inflammation.

Infectious Vulvovaginitis: Pathophysiology



Infectious Vulvovaginitis: **Bacterial vaginosis**

- **Epidemiology:** most common vaginal infection in women (22–50% of all cases).
- **Pathogen:** *Gardnerella vaginalis* (a pleomorphic, gram-variable rod).
- **Pathophysiology:** lower concentrations of *Lactobacillus acidophilus* led to overgrowth of *Gardnerella vaginalis* and other anaerobes, **without vaginal epithelial inflammation due to absent immune response**

Infectious Vulvovaginitis: Bacterial vaginosis

Risk factors:

- Sexual intercourse (primary risk factor, but it is not considered an STD)
- Intrauterine devices
- Vaginal douching
- Pregnancy

Clinical features:

- Commonly asymptomatic
- Increased vaginal discharge, usually gray or milky with fishy odor
- Pruritus and pain are uncommon.

Infectious Vulvovaginitis: Bacterial vaginosis- Diagnosis

Diagnosis is confirmed if three of the following Amsel criteria are met:

- Clue cells: Vaginal epithelial cells with a stippled appearance and fuzzy borders due to bacteria adhering to the cell surface.
- Vaginal pH > 4.5
- Positive amine test: The addition of 1–2 drops of potassium hydroxide to a sample of infected vaginal discharge emits a characteristic amine odor.
- Thin, homogeneous grey-white or yellow discharge.

Infectious Vulvovaginitis: Bacterial vaginosis- Treatment

- Asymptomatic: reassurance; often resolves without treatment
- Symptomatic: First-line in nonpregnant and pregnant patients: Oral metronidazole OR intravaginal metronidazole
- Treatment of partner is not recommended.

Complications:

Adverse pregnancy outcomes: Preterm delivery, spontaneous abortion, postpartum endometritis.

Thank you

Definitions

- Postcoital bleeding: spotting or bleeding during or after sexual activity that is unrelated to menstruation.
- Dyspareunia: Pain that occurs with vaginal intercourse or penetration.
- Proctitis: an inflammation of the lining of the rectum caused by sexually transmitted infections.
- Epididymitis: an inflammation of the epididymis
- Prostatitis: an inflammation of the prostate gland.
- Salpingitis: Inflammation of the fallopian tubes.
- Cervicitis: an infectious or non-infectious inflammation of the cervix.

Characteristics of Chlamydiaceae

Bacteria	Serotype	Target	Transmission	Disease
C. trachomatis	A–C	Eyes	Contact with discharge from the eyes or nose of infected persons	Trachoma
	D–K	<ul style="list-style-type: none">• Eyes• Genitourinary tract• Lungs	<p>Sexual activity</p> <p>Vaginal birth (in which the mother is infected)</p>	<ul style="list-style-type: none">• Chlamydial genitourinary infections• Proctitis• Neonatal chlamydial conjunctivitis• Infant pneumonia• Reactive arthritis
	L1–L3	<ul style="list-style-type: none">• Urinary tract• Anorectal area• Genitourinary tract	Sexual activity	Lymphogranuloma venereum (LGV)

Characteristics of Chlamydiaceae

Bacteria

Serotype

Target

Transmission

Disease

C. pneumoniae

-

Lungs

Person-to-person
transmission of
respiratory
secretions via
aerosols

Atypical pneumonia

C. psittaci

-

Lungs

Airborne
transmission

Atypical pneumonia