Chlamydia and Gardnerella

Urogenital Tract Module

Microbiology lecture 2

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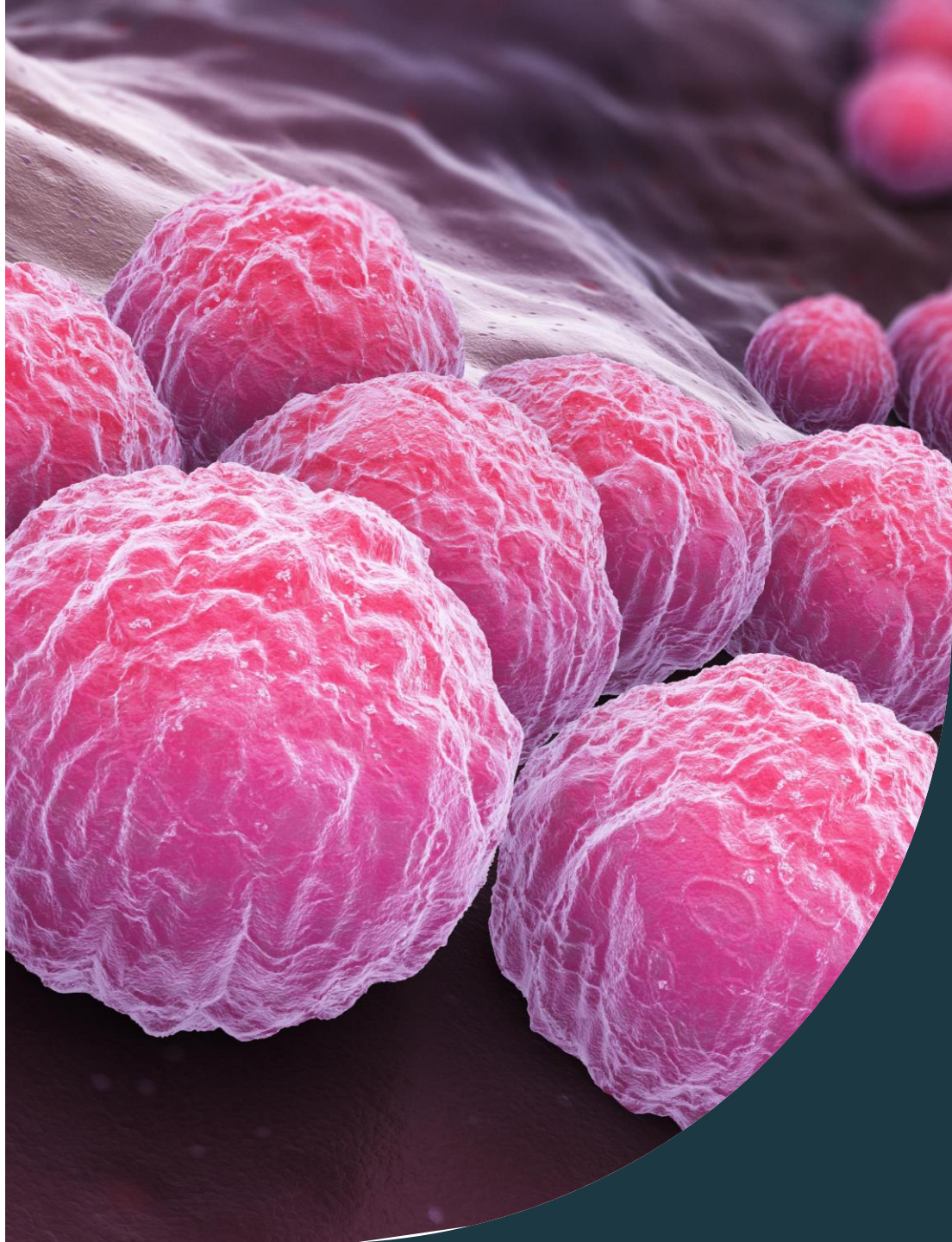


Outline

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

Chlamydia

Chlamydia: General characteristics

- **Gram-negative–like** ovoid, or coccoid-shaped bacterium
  - Morphologically, they are very small coccobacilli (0.25 to 0.3 μm in diameter).
  - Structurally, Chlamydia has a Gram-negative–like cell wall (with an inner and outer membrane but lacking a classic peptidoglycan layer).
  - In Gram staining → typically do not stain well
  - Absent peptidoglycan in the cell wall makes beta-lactam antibiotics ineffective.

Chlamydia: General characteristics

- **Obligate intracellular**

WHY they are obligate intracellular?

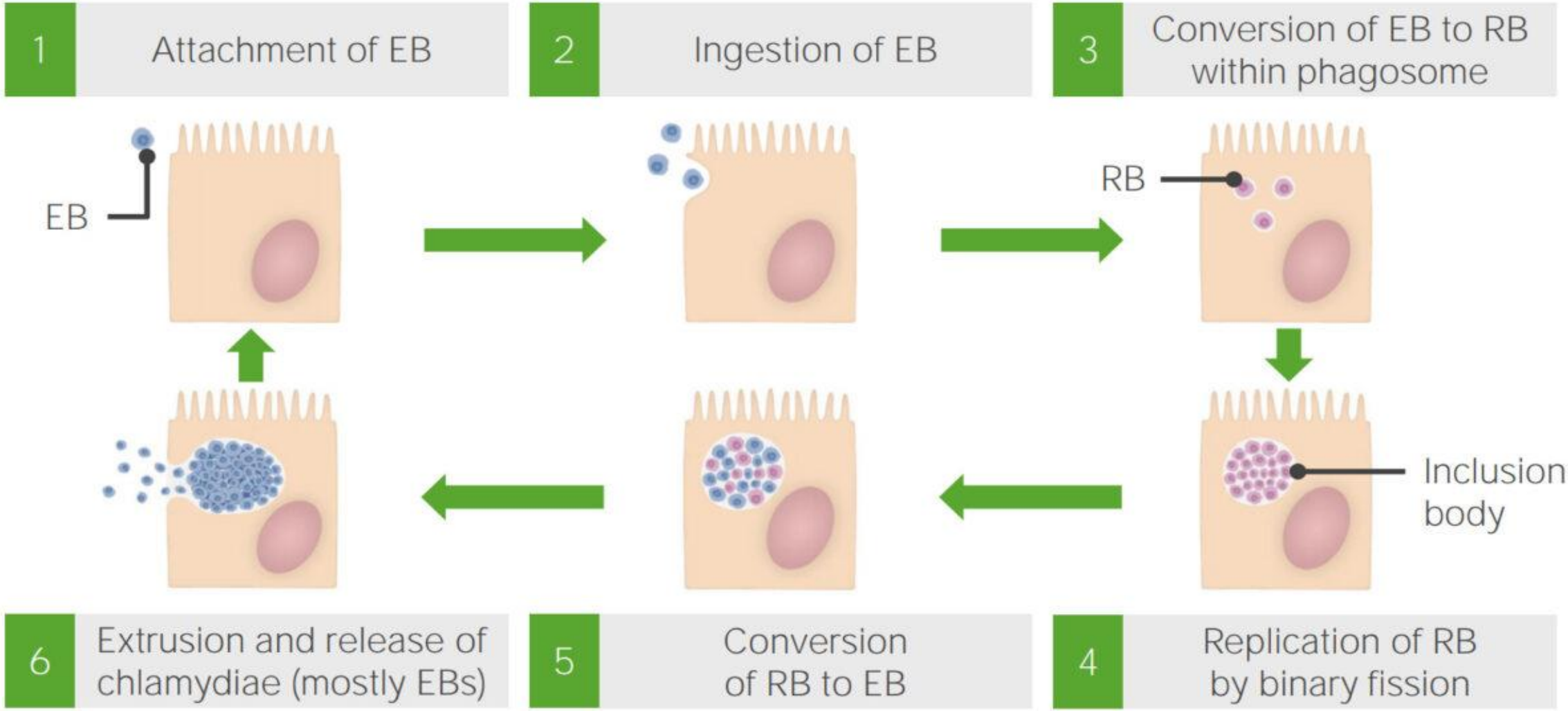
Its unable to produce its own ATP → Sometimes its called "**energy parasites**" because they steal ATP (and other metabolites) from the host cell they infect.

Very difficult cultivation

Chlamydia: Chlamydia life cycle

- All chlamydiae have unique biphasic developmental cycle:
- **Elementary body (EB):** the environmentally stable infectious particle is a small cell called the
  - These are about 0.3 μm in diameter
  - The EB membrane proteins have highly cross-linked membrane proteins.
  - The EBs have a high affinity for host epithelial cells and rapidly enter them.
- **Reticulate body (RB):**
  - Measuring about 0.5–1 μm. and devoid of an electron-dense nucleoid.
  - The RB grows in size and divides repeatedly by binary fission.

Chlamydia: Chlamydia life cycle



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 of EB 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. The RBs replicate by binary fission inside an endosome-derived vacuole; as they accumulate, this RB-filled vacuole is known as an **inclusion body.**
5. Transformation of reticulate bodies into elementary bodies
6. Lysis of endosomes and release of newly formed elementary bodies
7. New start of cycle

Chlamydia: Chlamydia life cycle- Mnemonic

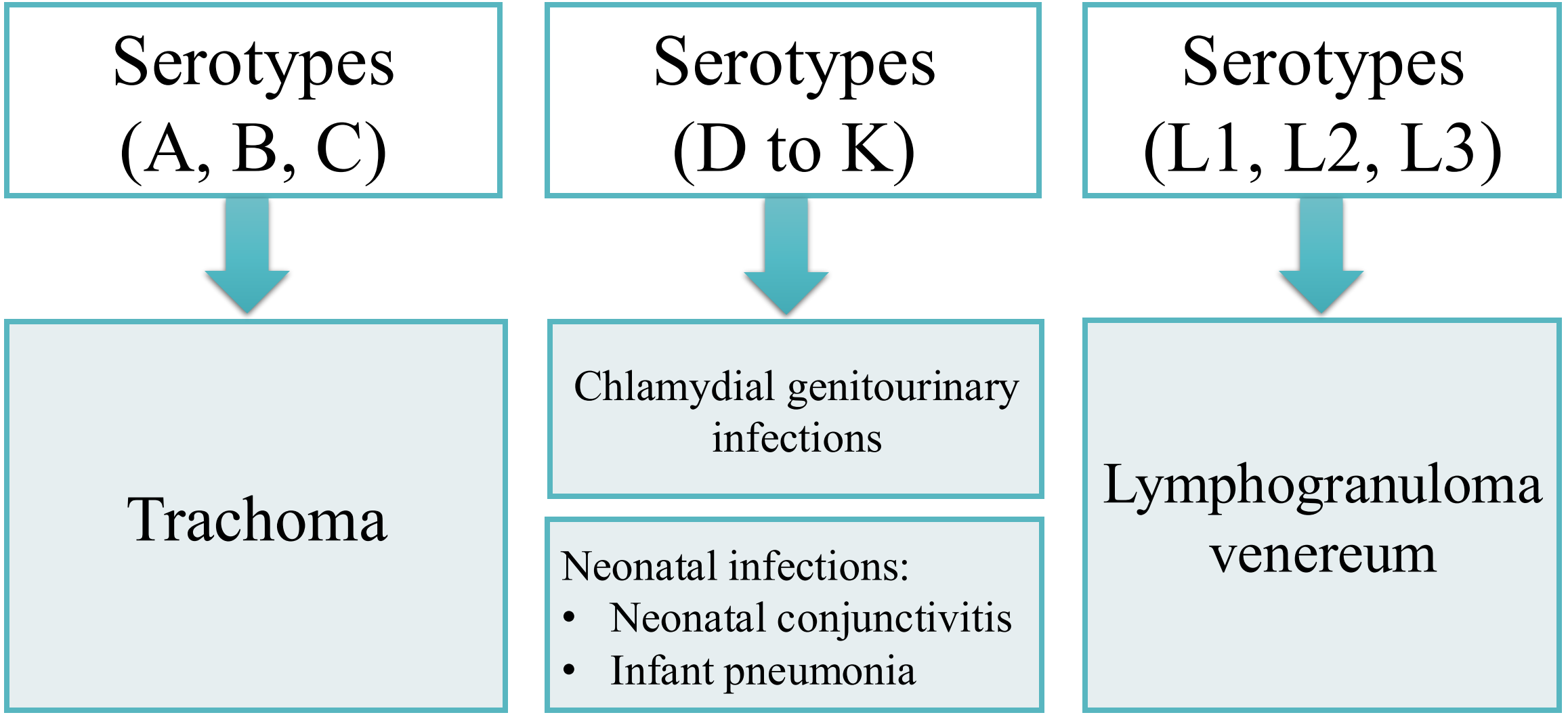
Elementary bodies survive in the **E**nvironment, **E**nter the cell via **E**ndocytosis, and **E**volve into reticulate bodies.

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

Chlamydia: Classification

- Chlamydiae that infect humans are divided into three species:
  - *Chlamydia trachomatis* (15 serotype)
  - *Chlamydophila pneumoniae*
  - *Chlamydophila psittaci*

Chlamydia: *C. trachomatis* Classification



Chlamydia: Genitourinary chlamydia

- Known also as Non-lymphogranuloma venereum
- **Etiology:** *Chlamydia trachomatis* serotypes D–K
- **Transmission:** May be transmitted through genital-to-genital contact.
- **Tissue tropism:** Columnar epithelium of mucosa (urethra, cervix, rectum)
- **Epidemiology:** One of the most common sexual transmitted infections (STIs) in developed countries.

Chlamydia: Genitourinary chlamydia- Clinical Presentation

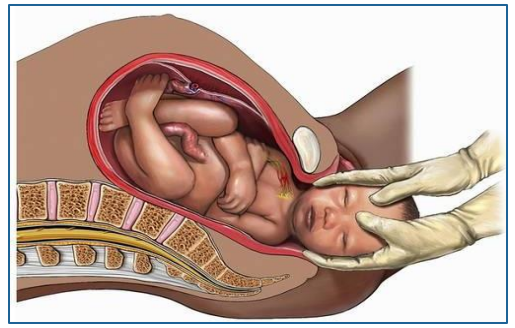
- **In sexually active men**, *C trachomatis* causes nongonococcal urethritis and, occasionally, epididymitis.
- **In women,** *C trachomatis* causes urethritis, cervicitis, and pelvic inflammatory disease, which can lead to sterility and predispose to ectopic pregnancy.
- **Proctitis** and **proctocolitis** may occur in men and women, although these infections appear to be most common in men who have sex with men.

Chlamydia: Genitourinary chlamydia- Clinical Presentation

- Any of these anatomic sites of infection may give rise to symptoms and signs, or the infection may remain asymptomatic but communicable to sex partners.
- Symptoms include mucopurulent discharge, dysuria, and pyuria, dyspareunia, Postcoital bleeding

- Genital secretions of infected adults can be self-inoculated into the conjunctiva, resulting in **inclusion conjunctivitis**, an ocular infection that closely resembles acute trachoma.

Chlamydia: Neonatal infections



- The newborn acquires the infection during passage through an infected birth canal.

Neonatal infections (serovars D–K)

- Neonatal conjunctivitis: Occurs 7–12 days after delivery
  - Causes eyelid swelling, hyperaemia, and purulent discharge
  - Occasionally, inclusion conjunctivitis persists as a chronic chlamydial infection
  - 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: Genitourinary chlamydia-Complications

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

Chlamydia: Lymphogranuloma venereum

- Etiology: Caused by Chlamydia trachomatis **serotypes L1–L3**
- Tissue tropism: Lymphatic tissue — invades through mucosa to reach lymph nodes
- **Lymphogranuloma Venereum:**
  - **Lympho-** targeted tissue
  - **Granuloma-** In pathology, a granuloma formation- specific type of chronic inflammatory lesion
  - **Venereum-** means sexually transmitted
- Epidemiology: Globally: more common in tropical and subtropical regions.

Chlamydia: Lymphogranuloma venereum- Clinical presentation

Primary stage (3–30 days post-exposure): Small painless papule or ulcer at inoculation site — often missed or already healed by the time the patient presents.

Chlamydia: Lymphogranuloma venereum- Clinical presentation

Secondary stage (2–6 weeks later): the regional lymph nodes enlarge and tend to become matted and painful.

- In men, **inguinal nodes** are most commonly involved, and the overlying skin often turns purplish as the nodes suppurate and eventually discharge pus through multiple sinus tracts.
- In women and in homosexual men, **the perirectal nodes** are prominently involved, with proctitis and a bloody mucopurulent anal discharge. Lymphadenitis may be most marked in the cervical chains.
- Systemic symptoms: fever, malaise, myalgia.

Chlamydia: Lymphogranuloma venereum- Clinical presentation

Tertiary stage:

- **The chronic inflammatory** process progresses to fibrosis, lymphatic obstruction, and rectal strictures.
- The lymphatic obstruction may lead to elephantiasis of the penis and scrotum.
- The chronic proctitis of women or homosexual men may lead to progressive rectal strictures, rectosigmoid obstruction, and fistula formation

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: Diagnosis

- Preferred test: Nucleic Acid Amplification Test (NAAT). It detects Chlamydia trachomatis RNA or DNA, e.g., by PCR
  - LGV requires genotyping to identify L serovars (standard NAAT can't distinguish — it just says "*C. trachomatis* positive")
- If clinical suspicion for LGV is high, start antibiotic treatment immediately rather than waiting for the results of diagnostic testing.
- **Specimen collection:**
  - In females: first-void urine, vaginal swab (preferred) , or cervical swab.
  - In males: first-void urine (preferred) or urethral swab.

Chlamydia: Genitourinary chlamydia- Treatment

- Start antibiotic therapy (even if asymptomatic)
  - Genitourinary chlamydia: Doxycycline **× 7 days** (or azithromycin)
  - LGV: Doxycycline **× 21 days** — three times longer because of lymphatic involvement
- Evaluate and treat partners.
- Test for common sexually transmitted coinfections (HIV testing, gonorrhoea testing, syphilis testing)
- Report all cases of LGV and genitourinary chlamydia to the local health department.

Genitourinary chlamydia vs Lymphogranuloma Venereum

Feature	Genitourinary Chlamydia	Lymphogranuloma Venereum (LGV)
Serovars	D–K	L1, L2, L3
Tissue tropism	Columnar epithelium of mucosa (urethra, cervix, rectum)	**Lymphatic tissue** — invades through mucosa to reach lymph nodes
Invasiveness	Superficial, stays at mucosa	Invasive, spreads via lymphatics
Cells infected	Epithelial cells	Epithelial cells and macrophages

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.

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.

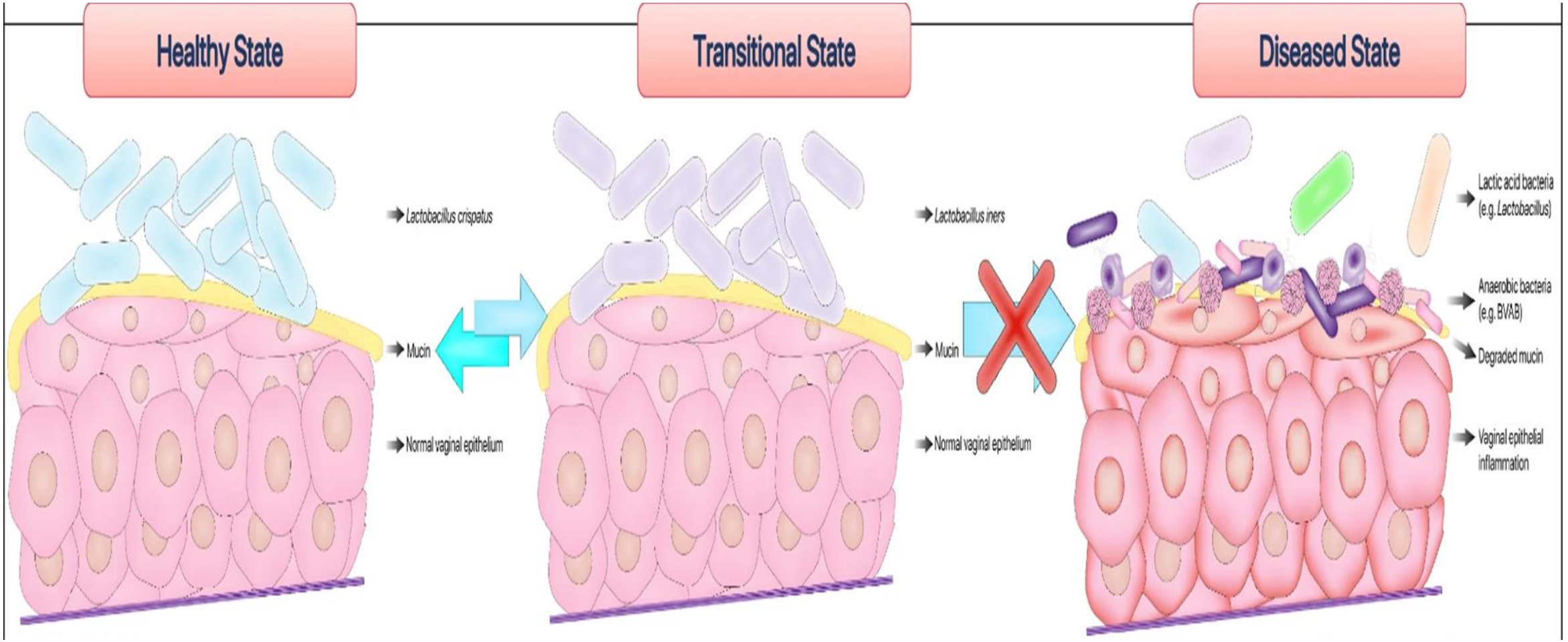
Infectious Vulvovaginitis: Bacterial vaginosis

- **Epidemiology:** most common vaginal infection in women (22–50% of all cases).
- Among women with bacterial vaginosis, culture of vaginal fluid has shown:
  - markedly increased prevalences and concentrations of *G. vaginalis*, *Mycoplasma hominis*, and several anaerobic bacteria .
  - as well as an absence of hydrogen peroxide–producing Lactobacillus spp., which constitute most of the normal vaginal flora and perhaps help protect against certain cervical and vaginal infections.

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

Risk factors:

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

- Increased white homogeneous vaginal discharge
- Microscopic demonstration of “clue cells” (vaginal epithelial cells coated with coccobacillary organisms, which have a granular appearance and indistinct borders
- Vaginal discharge pH of >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.

Infectious Vulvovaginitis: Bacterial vaginosis-Treatment

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

Complications:

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

Thank you