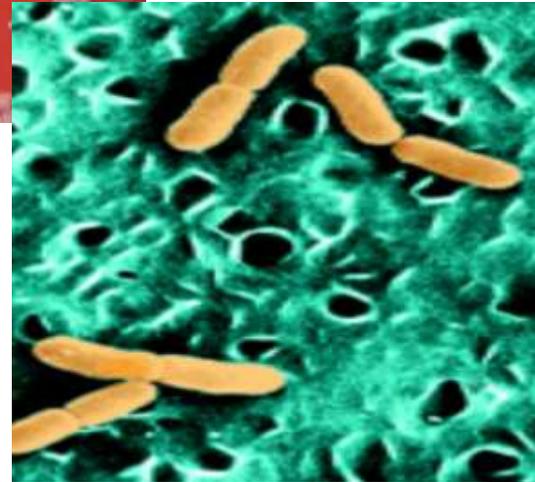
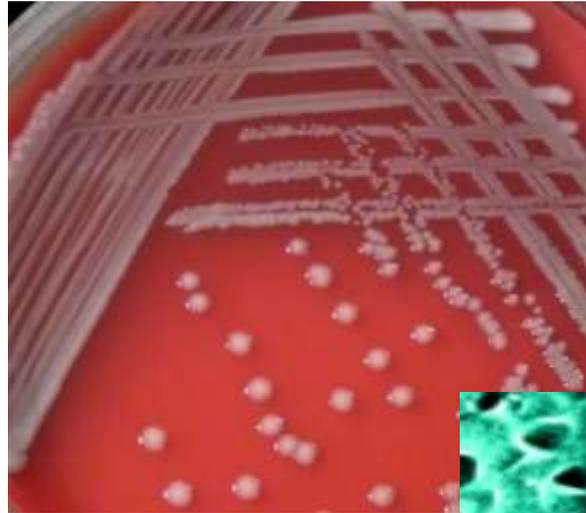


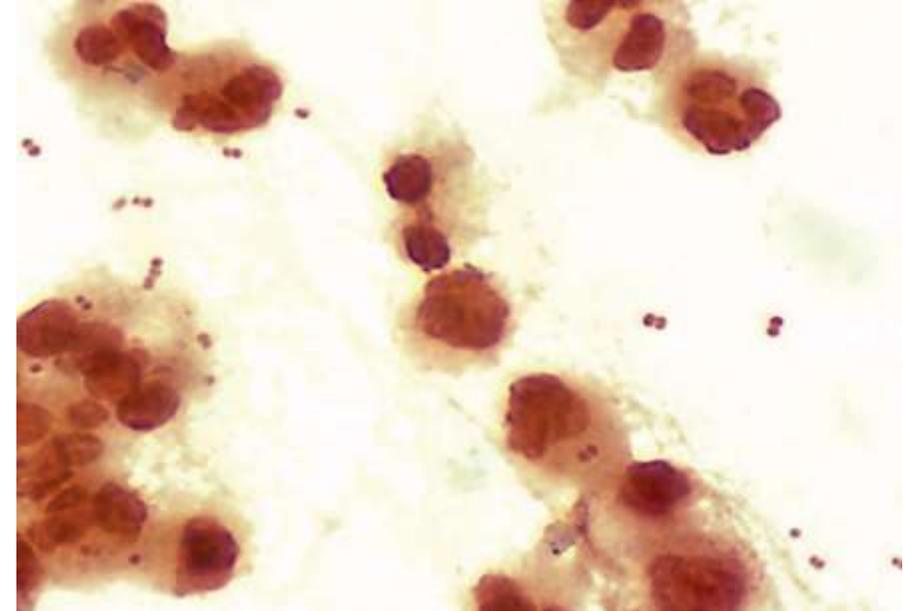
Microbiology of Urogenital system



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Edited by: Dana Alnasra ♥

- A **purulent infection** of **mucous membranes** (e.g. urethra, rectum, cervix, conjunctiva, pharynx) caused by ***N. gonorrhoeae***.
- *Neisseria* species are aerobic **gram-negative** bacteria, typically coccoid shaped arranged in pairs (**diplococci**)
not part of normal flora
- The presence of ***N. gonorrhoeae*** in a clinical specimen is **always considered significant**. In contrast, strains of *N. meningitidis* can **colonize the nasopharynx of healthy people** without producing disease.
- *N. gonorrhoeae* is **fastidious** and **only grows on enriched chocolate agar** and other supplemented media.

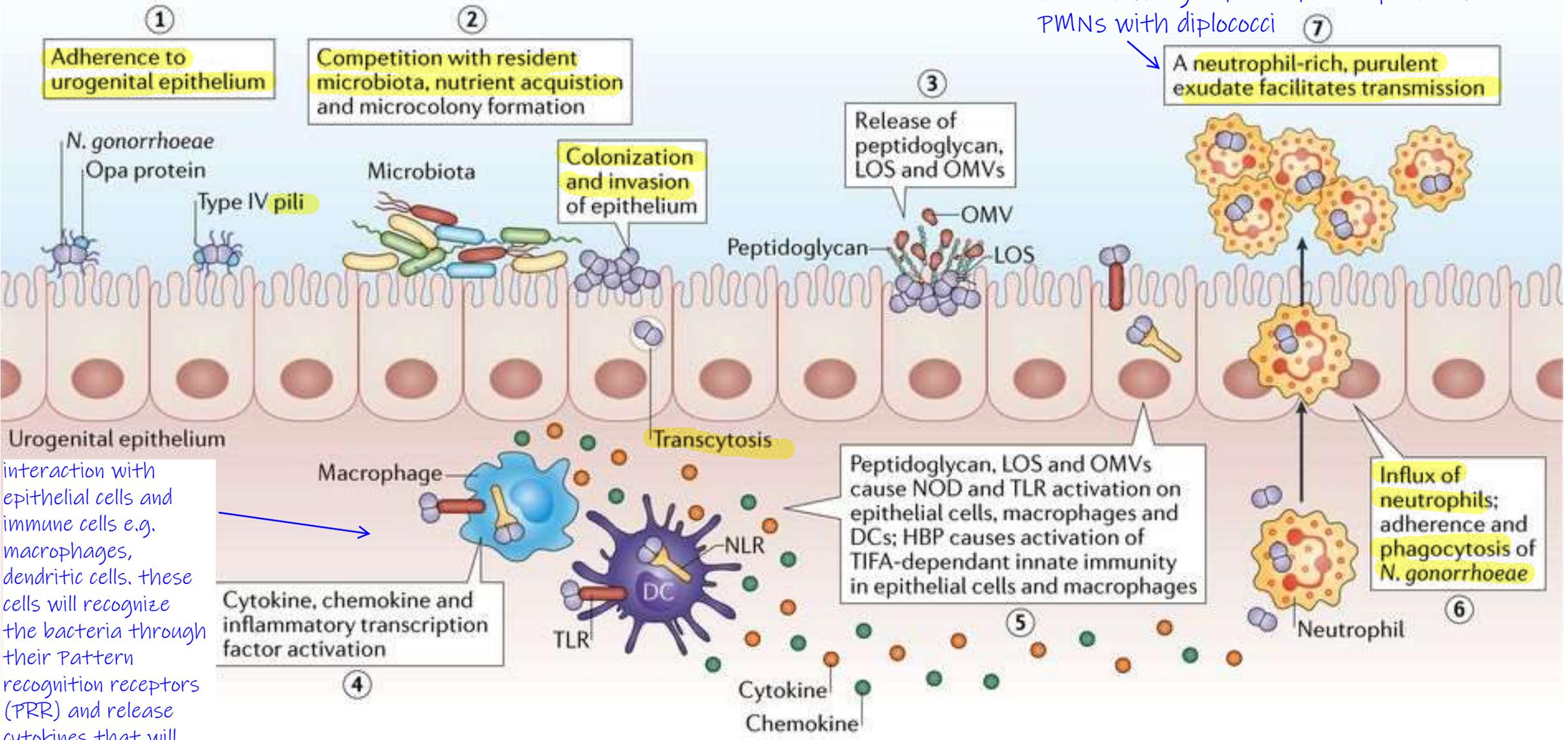


Gonorrhoea / epidemiology

bacterial
↑ *following chlamydia*

It is the **second commonest STI** in the UK, affecting predominantly young people (peaking in males aged 20– 24 years and females aged 16– 19 years). The recent increase in incidence and **growing prevalence of antimicrobial resistance** have made it a major **public health concern**.

Gonorrhoea / pathophysiology



so a discharge of an infected person will contain PMNs with diplococci

interaction with epithelial cells and immune cells e.g. macrophages, dendritic cells. these cells will recognize the bacteria through their Pattern recognition receptors (PRR) and release cytokines that will attract neutrophils.

Gonorrhoea / signs and symptoms

- Genital infection in men is primarily restricted to the **urethra**. A purulent **urethral discharge and dysuria** develop after a 2- to 5-day incubation period. **Virtually all infected men have acute symptoms.**
- As many as **half of all infected women have mild or asymptomatic** infections.
ascending infection e.g. to cervix, uterus, fallopian tubes
- Retrograde spread may occur, causing **salpingitis/ endometritis, PID**, and **tubo-ovarian abscesses** in up to **20%** of women with cervicitis.
pelvic inflammatory disease

Neisseria gonorrhoeae

Gonorrhea: characterized by purulent discharge for involved site (e.g., urethra, cervix, epididymis, prostate, rectum) after 2- to 5-day incubation period

Disseminated infections: spread of infection from genitourinary tract through blood to skin or joints; characterized by pustular rash with erythematous base and suppurative arthritis in involved joints

Ophthalmia neonatorum: purulent ocular infection acquired by neonate at birth



MALE

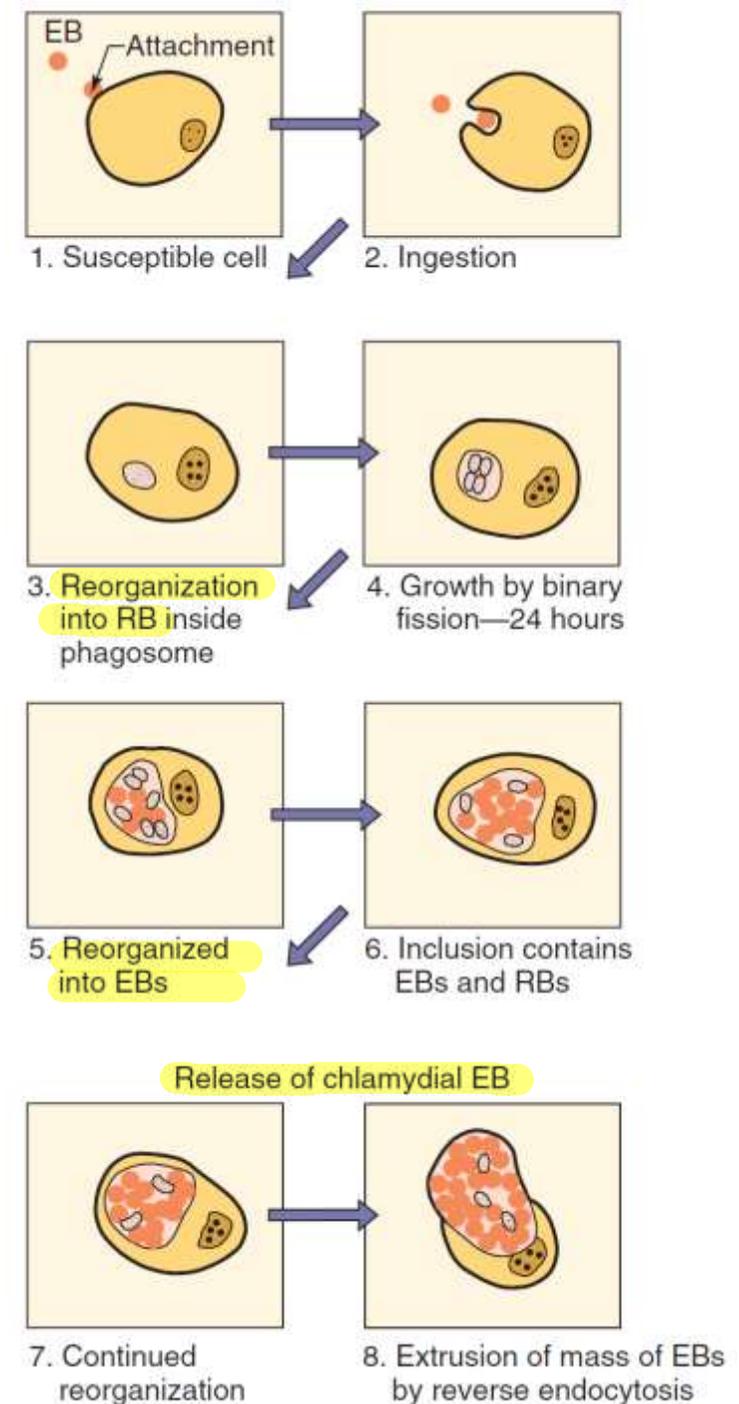


FEMALE

- Samples include **Exudates** (by a swab into urethra), **urine, cervical or throat swabs**
- **Microscopy**— provides rapid, near- patient diagnosis in symptomatic patients and shows **Gram- negative diplococci** within polymorphonuclear cells.
- **Culture**— all infected areas should be swabbed and plated onto selective media, both to confirm diagnosis and to provide antibiotic susceptibility data. *gram stain of G(-) diplococci + positive culture on chocolate agar from a vaginal discharge can be presumptive of gonorrhoea*
- **Nucleic acid amplification tests** (NAATs)— these have become the **screening test of choice** for asymptomatic individuals with urethral and endocervical infection, and for rectal and pharyngeal infection in MSMs.
- **Treatment should include patient and sexual partner/s.**
- First- line therapy is **ceftriaxone** 500mg IM single dose plus **azithromycin** 1g PO single dose

Chlamydia / etiology

- A common STD caused by *Chlamydia trachomatis*. An **obligate intracellular** parasites, 0.3 microm in diameter, with a **unique life cycle**.
- Infects epithelial cells, which are found on the mucous membranes of the **urethra, endocervix, endometrium, fallopian tubes, anorectum, respiratory tract, and conjunctivae** → important in transmission
 - this form survives extracellularly (this helps in transmission through inanimate objects)
- Metabolically inactive **infectious forms (elementary bodies [EBs])** and metabolically active **noninfectious forms (reticulate bodies [RBs])**.



Chlamydia / epidemiology

because many can be asymptomatic, in addition to the unique life cycle that makes it survive extracellularly



- Chlamydia infections are the **most common bacterial sexually transmitted diseases** in humans and are **the leading cause of infectious blindness** worldwide
- Other than **sexual transmission**, **eye-to-eye transmission** of trachoma is by **droplet, hands, contaminated clothing**, and flies that transmit ocular discharges from the eyes of infected children to the eyes of uninfected children.
- **Trachoma is the leading cause of preventable blindness.** Infections occur predominantly in children, who are the chief reservoir of ***C. trachomatis*** in endemic areas.

in endemic areas, children serve as the reservoir for chlamydia (conjunctival transmission)

Chlamydia / signs and symptoms

- Most genital tract infections in women are asymptomatic (as many as 80%) while most in men are symptomatic, as many as 25% of the infections will be inapparent.
- infection may persist for many years if untreated, infection can spread to the upper genital tract in women causing pelvic inflammatory disease which may result in future infertility or ectopic pregnancy
- It can cause cervicitis in women and urethritis and proctitis in both men and women.
inflammation in the rectum
- Other presentations— Lymphogranuloma venereum LGV (the cause of 10% of genital ulcers in tropical countries)



Inflammation of the cervix in a female from chlamydia infection characterized by mucopurulent cervical discharge, redness, and inflammation.

Chlamydia trachomatis

Trachoma: chronic inflammatory granulomatous process of eye surface, leading to corneal ulceration, scarring, pannus formation, and blindness

Adult inclusion conjunctivitis: acute process with mucopurulent discharge, dermatitis, corneal infiltrates, and corneal vascularization in chronic disease

Neonatal conjunctivitis: acute process characterized by a mucopurulent discharge

Infant pneumonia: after a 2- to 3-week incubation period, the infant develops rhinitis, followed by bronchitis with a characteristic dry cough

Urogenital infections: acute process involving the genitourinary tract with characteristic mucopurulent discharge; asymptomatic infections common in women

Lymphogranuloma venereum: a painless ulcer develops at the site of infection that spontaneously heals, followed by inflammation and swelling of lymph nodes draining the area, then progression to systemic symptoms

though the dr. said it's painful ulcer

first part of the urine stream passed

- Samples include **Exudates** (by a swab into urethra), **first catch urine**, **cervical or throat swabs**
because it's intracellular and difficult to grow
- **Culture**— not routinely recommended, with low sensitivity and expensive.
- **Nucleic acid amplification tests (NAATs)**— these have become the **diagnostic test of choice**, as they are **highly sensitive** (90– 95%).
- Treatment should include **patient and sexual partner/s**.
- The drug of choice for reasons of compliance is **doxycycline** 100mg bd PO for 7 days or **azithromycin** 1g single dose

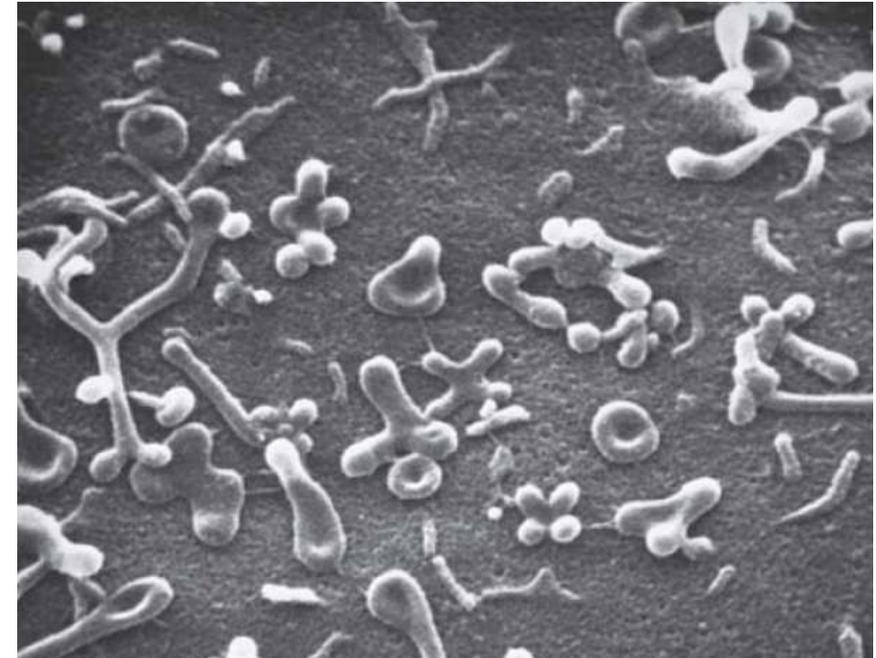
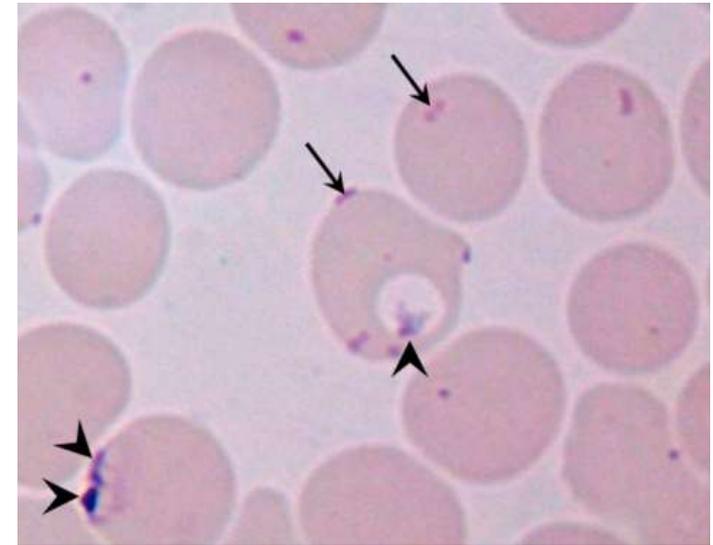
Nongonococcal urethritis caused by Mycoplasma

urethritis is classified into gonococcal (caused by *N.gonorrhoea*) and nongonococcal (caused by other pathogens)

- ***Mycoplasma* and *Ureaplasma*** organisms are the **smallest free-living bacteria**. They are unique among bacteria because they **do not have a cell wall** and their cell membrane contains **sterols**.

that's why they have many different shapes

- ***M. genitalium* and *Ureaplasma urealyticum*** can cause **nongonococcal urethritis (NGU)** and **pelvic inflammatory disease**.



Nongonococcal urethritis caused by Mycoplasma

(NAATs)

- The most sensitive **diagnostic tests are PCR amplification** tests of species-specific gene targets. *Remember we can't do a gram stain, as it doesn't have a cell wall!*
- Absence of the cell wall renders the mycoplasmas resistant antibiotics that interfere with synthesis of the cell wall (e.g. Penicellins).
- **Rising incidence and emerging antimicrobial resistance are a major concern these days.**
- The poor clinical outcomes with **doxycycline** therapy led to the use of **azithromycin** as the primary drug of choice

Organism	Site	Human Disease
<i>Mycoplasma genitalium</i>	Genitourinary tract	Nongonococcal urethritis, pelvic inflammatory disease
<i>Ureaplasma urealyticum</i>	Respiratory tract, genitourinary tract	Nongonococcal urethritis, pyelonephritis, spontaneous abortion, premature birth

Vulvovaginal candidiasis / etiology

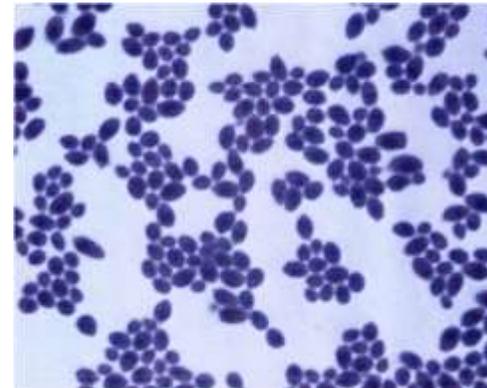
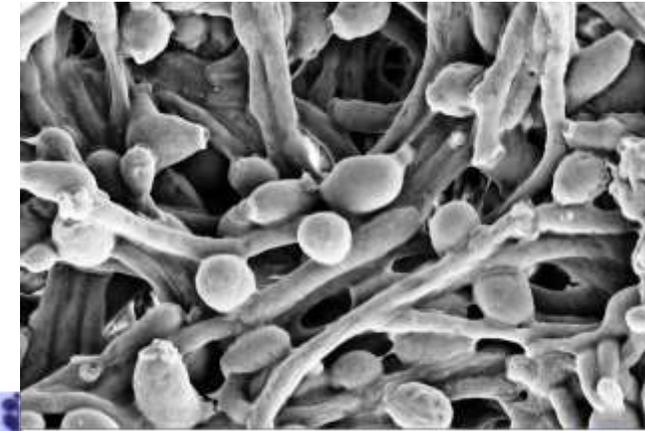
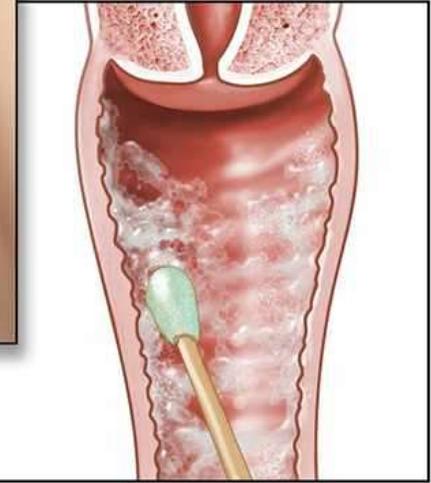
overpopulation of *Candida* species in the vagina causing white plaques and exudate

- Candidiasis is an infection caused by ***Candida albicans***, which is an **opportunistic pathogenic yeast** that is a common member of the human **gut flora** and the vaginal flora as well.
- *Candida* spp. may be found in the lower genital tract of 10– 20% of asymptomatic women.
- **29– 49% of premenopausal women reporting at least one episode of candidiasis.** *it is very rarely transmitted to men*
- Candidal infection is uncommon in prepubertal women



Vulvovaginal candidiasis

©2016
MAYO



Vulvovaginal candidiasis / signs and symptoms

- ***C. albicans* is the cause of 80– 92% of cases, but the incidence of other *Candida* spp., such as *C. glabrata* can occur.**
 - **Recurrent infection**— defined as ≥ 4 episodes a year and seen in 5– 8% of women.
- susceptibility seems to be largely determined genetically.

cause changes in the vaginal ecology

Vulvovaginal Candidiasis



Risk factors

- Diabetes
- HIV
- Recent antibiotic use
- Pregnancy

Clinical

- Pruritus
- Dysuria
- Dyspareunia

Discharge

- White, cottage cheese-like
- pH < 4.5
- KOH odor neg
- Pseudohyphae, spores

Vulvovaginal candidiasis / diagnosis and treatment

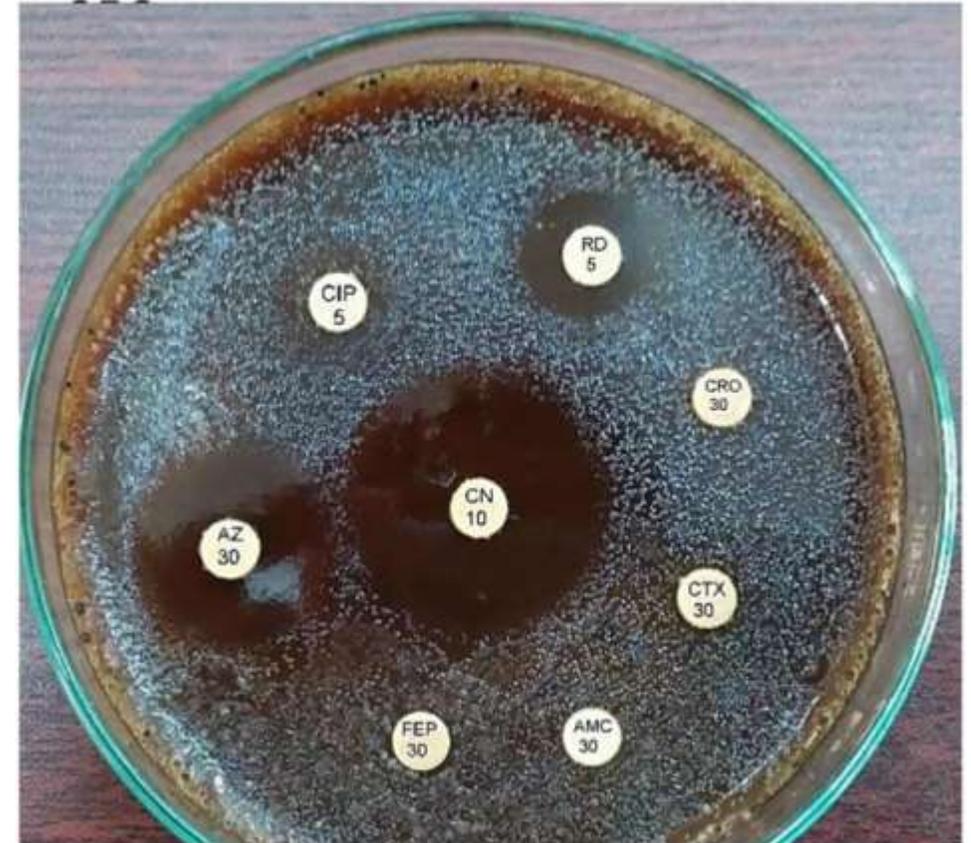
- **wet mount of the discharge with 10% KOH may allow recognition of yeast and hyphae, but microscopy is negative in around 50%.**
- **Self- diagnosis unreliable**— one study demonstrated that only 34% of those women self-diagnosing candidal infection actually had it.
- **Vaginal pH is around 4– 4.5 (unlike trichomonal infection or BV).**
- Perform culture in patients with persistent discharge or recurrent symptoms unresponsive toazole treatment

- **90% of cases represent uncomplicated infections** (healthy, non-pregnant women with mild/moderate symptoms, infrequent episodes and infection with *C. albicans*).
- **Oral and topical treatments** are similarly effective, with topical therapy relieving symptoms more rapidly, but oral being preferred by women, e.g. PO **fluconazole**.
- The **immunosuppressed and those with severe symptoms are unlikely to respond to short treatment courses— 7– 14 days of topical therapy is recommended**
- **Pregnancy— treat only for symptoms** using a **topical imidazole** for 7– 14 days (e.g. clotrimazole). **Oral azoles are contraindicated in pregnancy**

A 26-year-old male patient came to the dermatology clinic of Tanta University hospital complaining from severe burning sensation during urination and dysuria for 4 days. Additionally, he was suffering from penile discharge and testicular tenderness. He had a history of multiple heterosexual relationships with a last contact 8 days ago. On physical examination, vital signs showed: blood pressure 110/79, pulse 75, and temperature 37.6°C. There was mucopurulent cloudy discharge from urethra. Swollen testicles were also observed. When the patient asked about any other symptoms, he mentioned feeling fatigue with pain in the knee joints and ankles 2 weeks ago but he did not receive any medical remedy until the appearance of severe irritation, redness in the eye, as well as edema in the eyelid with the presence of copious discharge (conjunctivitis). These symptoms seem to be unrelated to a degree that may obscure the diagnosis.

Following counseling, urethral and ocular swabs, and blood sample were aseptically obtained and streaked immediately on Thayer Martin and chocolate agar plates ^{if it was gonorrhoea it should only grow on chocolate agar} then incubated overnight at 37°C in the presence of 5% CO₂. Following the incubation period, Grayish white, transparent to opaque, slightly raised colonies with 1–2 mm diameter were observed. After Gram-staining, pink to red diplococci with coffee bean-shaped cells opposing each other on the concave sides. This result was sufficient for the presumptive identification of *N. gonorrhoeae*. Furthermore, numerous polymorphonuclear cells with intracellular diplococci, were

The results of susceptibility testing were interpreted according to CLSI. It revealed multiple drug resistance to ampicillin, ampicillin/clavulanic acid, cephradine, cefotaxime, cefepime, cefuroxime, ceftriaxone, ciprofloxacin, chloramphenicol, sulfamethoxazole, trimethoprim, tetracycline, doxycycline, and spectinomycin. Only gentamicin, rifampicin, and azithromycin were active against the test pathogen



History

- 17-year-old white female
- College student
- Seeking advice about contraception
- Shy talking about her sexual practices
- Has never had a pelvic exam
- Has had two sex partners in past six months *risk factors for STDs*
- Does not use condoms or any other contraceptives
- Her periods have been regular, but she has recently noted some spotting between periods. Last menstrual period was 4 weeks ago.
- Denies vaginal discharge, dyspareunia, genital lesions, or sores

Physical examination

- Vital signs: blood pressure 118/68, pulse 74, respiration 18, temperature 37.1° C
- Breast, thyroid and abdominal exam within normal limits
- The genital exam reveals normal vulva and vagina
- The cervix appears inflamed, bleeds easily with swab insertion for diagnostic testing, and there is a purulent discharge coming from the cervical os.
- The bimanual exam is normal without cervical motion pain, uterine or adnexal tenderness.

3. Which laboratory tests should be ordered or performed?

- Pregnancy test
- Test for *Chlamydia trachomatis*
- Test for *Neisseria gonorrhoeae*
- Syphilis screen with RPR or VDRL
- Saline wet mount, pH and KOH preparation of vaginal secretions
- Counseling and testing for HIV

ALL of them :)

Laboratory Test Results for Suzy Jones

- NAAT for *Chlamydia trachomatis*: positive
- NAAT for *Neisseria gonorrhoeae*: negative RPR: non-reactive
- Wet mount: pH 4.2, no clue cells or trichomonads but numerous white blood cells (WBCs)
- KOH preparation: negative for "whiff test"
- HIV antibody test: negative
- Pregnancy test: negative

whiff test is performed by adding several drops of 10% potassium hydroxide to a sample of vaginal discharge. A strong fishy odor is indicative of a positive test

A 39-year-old man presented to the emergency department reporting several weeks of generalized weakness, headache, nausea, and migratory arthralgia. The patient had exclusively had sex with men, had participated in condomless anal insertive and receptive intercourse, and had been in a monogamous relationship during the past 6 months.

Physical examination revealed a painful ulcerated plaque on the upper lip, a macular rash with three crater-like scarred painless lesions (considered to be healing chancres) on the glans, a nonpruritic hyperkeratotic maculopapular palmar rash and bilateral submandibular lymphadenopathy. No alopecia, gummas, neurologic deficits or ocular or cardiovascular abnormalities were noted.

think of syphilis

secondary syphilis

no tertiary syphilis

Ulcerated plaque on the upper lip. Results of laboratory testing included a positive reactive syphilis immunoglobulin G (IgG) enzyme immunoassay and a positive rapid plasma reagin (RPR) test (titer 1:256). Human immunodeficiency virus (HIV) testing was negative, and serologic testing demonstrated prior immunization to hepatitis B virus. Given the clinical presentation and laboratory findings, secondary syphilis was considered the most probable diagnosis. *testing for HIV and hep.B because of similar risk factors*

The patient was treated with benzathine penicillin G 2.4 million units intramuscularly.





Clinical Case 23-1 Gonococcal Arthritis

Gonococcal arthritis is a common presentation of disseminated *Neisseria gonorrhoeae* infection. Fam and associates (*Can Med Assoc J* 108:319–325, 1973) described six patients with this disease, including the following patient, who has a typical presentation. A 17-year-old girl was admitted to the hospital with a 4-day history of fever, chills, malaise, sore throat, skin rash, and polyarthralgia. She reported being sexually active and having a 5-week history of a profuse yellowish vaginal discharge that was untreated. Upon presentation, she had erythematous maculopapular skin lesions over her forearm, thigh, and ankle, and her metacarpophalangeal joint, wrist, knee, ankle, and midtarsal joints were acutely inflamed. She had an elevated leukocyte count and sedimentation rate. Cultures of her cervix were positive for *N. gonorrhoeae*, but blood specimens, exudates for the skin lesions, and synovial fluid were all sterile. The diagnosis of disseminated gonorrhea with polyarthrititis was made, and she was successfully treated with penicillin G for 2 weeks. This case illustrates the limitations of culture in disseminated infections and the value of a careful history.

only constitutional symptoms

we can say her constitutional symptoms are caused by disseminated infection

History

Tanya Walters is a 24-year-old single female who presented at her clinic with complaints of a smelly, yellow vaginal discharge and slight dysuria for one week.

- Denies vulvar itching, pelvic pain, or fever
- Has had 2 sex partners over the past 6 months—did not use condoms with these partners—on oral contraceptives for birth control
- No history of sexually transmitted diseases, except for trichomoniasis one year ago
- Last check-up one year ago

Physical Exam

- Vital signs: blood pressure 112/78, pulse 72, respiration 15, temperature 37.3° C
- Cooperative, good historian
- Chest, heart, breast, musculoskeletal, and abdominal exams within normal limits
- No flank pain on percussion
- Normal external genitalia with a few excoriations near the introitus, but no other lesions
- Speculum exam reveals a moderate amount of frothy, yellowish, malodorous discharge, without visible cervical mucopus or easily induced cervical bleeding
- Bimanual examination was normal without uterine or adnexal tenderness

Laboratory Results

Vaginal pH—6.0

Saline wet mount of vaginal secretions—numerous motile trichomonads and no clue cells

KOH wet mount—negative for budding yeast and pseudohyphae

A patient has been diagnosed with primary syphilis (Stage I). When assessing the patient, which of these findings will the healthcare provider anticipate?

Choose 1 answer:

A Reddish rash on the palms of the hands

B Firm and painless genital ulcers

C Sore throat and swollen lymph glands

D Muscle weakness and visual changes

Further reading:

- Oxford handbook of infectious diseases and microbiology-
Part4: Clinical syndroms
Chapter 18: Sexually transmitted infections
- Harrison's Infectious Diseases 3rd Edition
SECTION III Infections in organ systems
Chapter 35