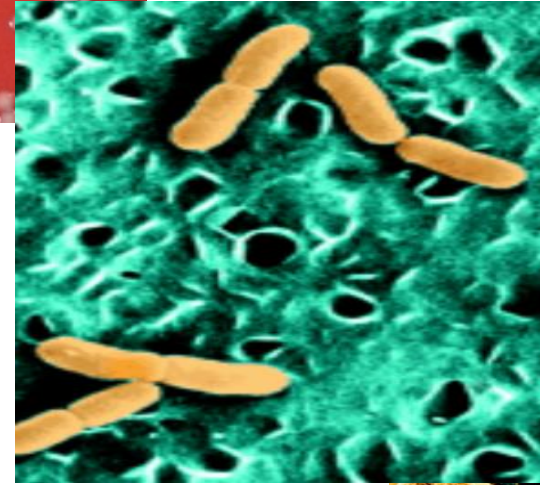
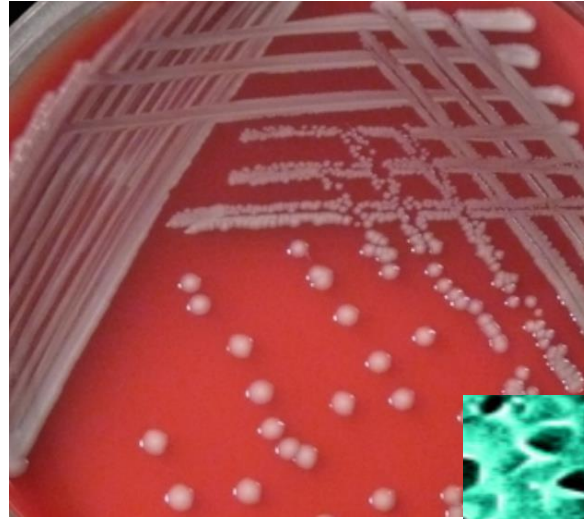


Microbiology of Urogenital system



Anas Abu-Humaidan
M.D. Ph.D.

Genital infections encompasses a variety of clinical entities, including :

- **Bacterial vaginosis**
- **Chancroid**
- **Gonorrhoea**
- **Chlamydia**
- **Syphilis**
- ***Mycoplasma genitalium***
- **Trichomoniasis**
- **Vulvovaginal candidiasis**
- **Genital warts**
- **Human immunodeficiency virus.**
- **Genital herpes**

SEXUALLY TRANSMITTED AND SEXUALLY TRANSMISSIBLE MICROORGANISMS		
BACTERIA	VIRUSES	OTHER ^a
Transmitted in Adults Predominantly by Sexual Intercourse		
Neisseria gonorrhoeae	HIV (types 1 and 2)	Trichomonas vaginalis
Chlamydia trachomatis	Human T cell lymphotropic virus type 1	Pthirus pubis
Treponema pallidum	Herpes simplex virus type 2	
Haemophilus ducreyi	Human papillomavirus (multiple genital genotypes)	
Klebsiella (Calymmatobacterium) granulomatis	Hepatitis B virus ^b	
Ureaplasma urealyticum	Molluscum contagiosum virus	
Mycoplasma genitalium		

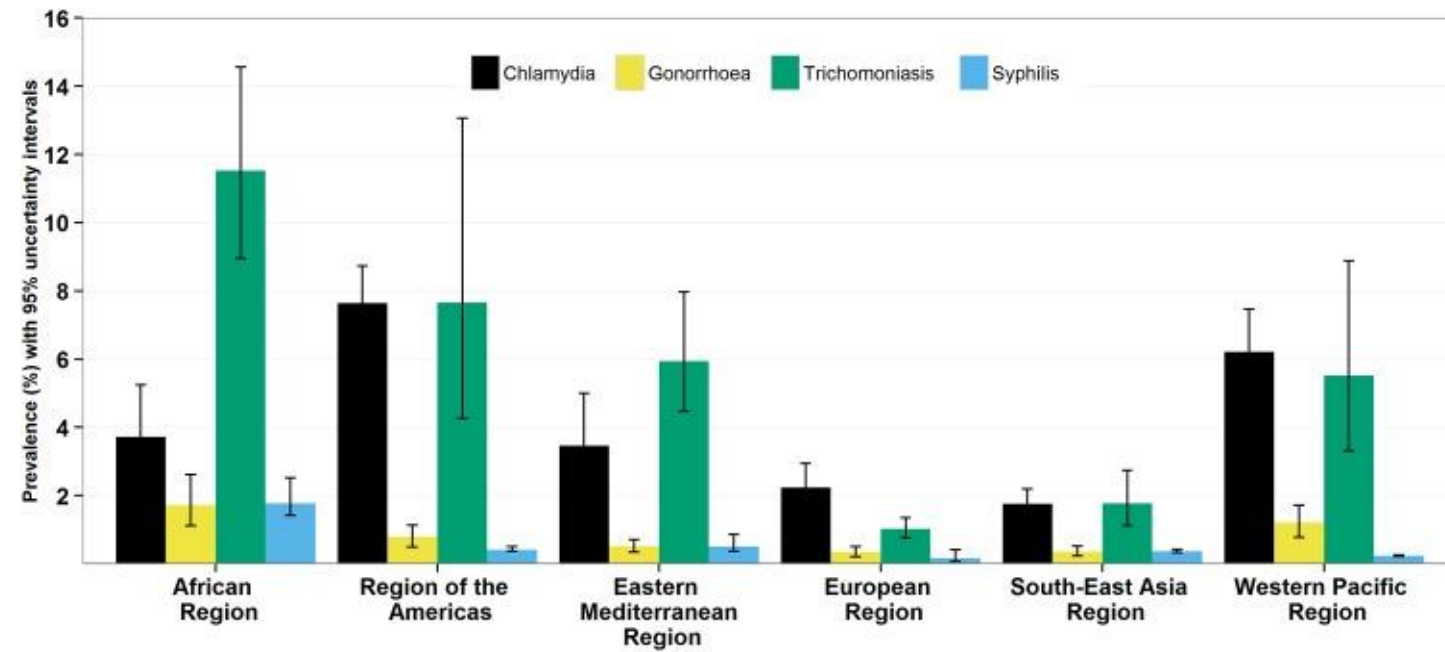
- Symptoms and signs of disease may include **vaginal discharge, penile discharge, ulcers** on or around the genitals, and **pelvic pain**. **Dysuria** and **dyspareunia** can also happen. Many STDs can be **asymptomatic**.
- Patients with one STI **should be assessed for the presence of others**, because of similar risk factors and vulnerability of an inflamed genital epithelium to other infections.
- **Risk factors** include:
 - The number of sexual partners and frequency of partner change
 - Failure to use barrier contraception,
 - Lower socioeconomic status,
 - Age <25 years
 - Symptomatic partner,
 - Sexual orientation (syphilis, gonorrhoea, HIV, and hepatitis B are more prevalent amongst MSM in the UK), and sexual practices (orogenital and anogenital contact).

WHO estimates of new cases of chlamydia, gonorrhoea, trichomoniasis, and syphilis among adults for 1995, 1999, 2005, and 2008 using various methods [4 –7].

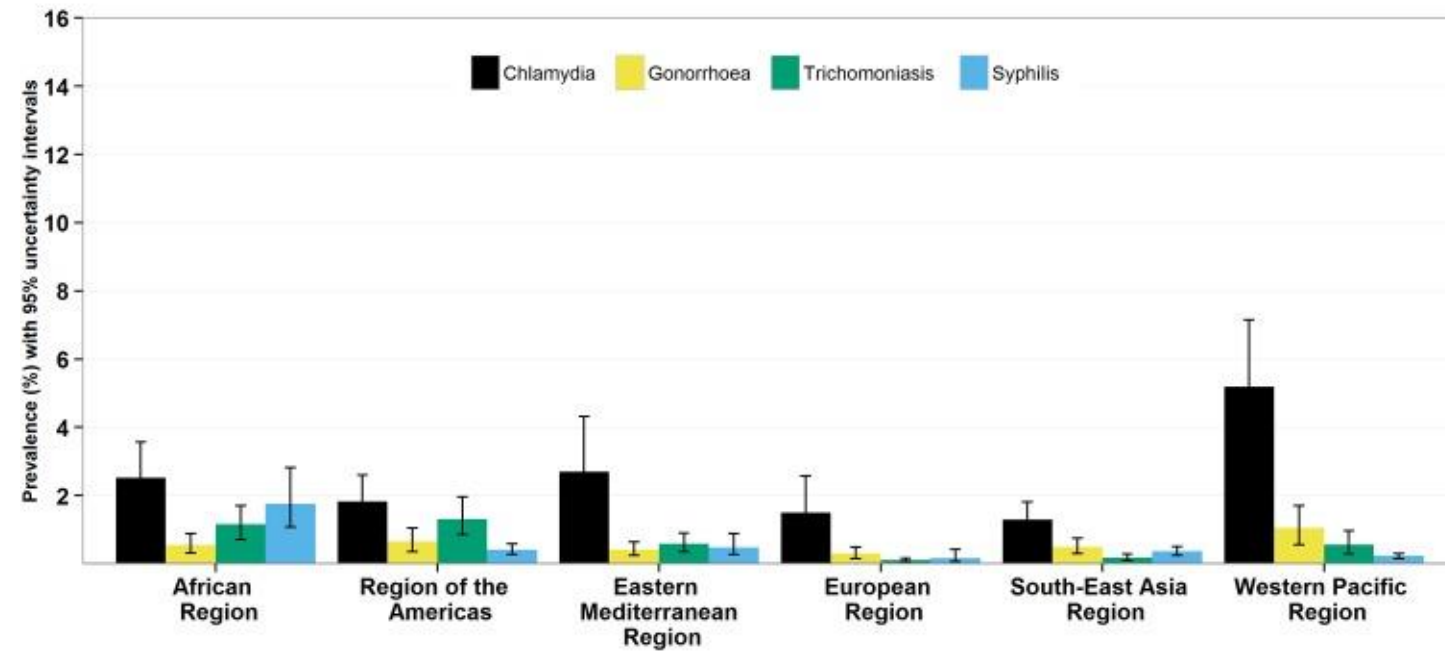
	Estimated number of new cases (millions)			
	1995	1999	2005	2008
Chlamydia	89	92	101	106
Gonorrhoea	62	62	88	106
Trichomoniasis	170	174	248	276
Syphilis	12	12	11	10

- In 2012, among **women aged 15–49 years**, the estimated global prevalence of **chlamydia was 4.2%** (3.7–4.7%), **gonorrhoea 0.8%** (0.6–1.0%), **trichomoniasis 5.0%** (4.0–6.4%), and **syphilis 0.5%** (0.4–0.6%); among **men**, estimated **chlamydia** prevalence was **2.7%** (2.0–3.6%), **gonorrhoea 0.6%** (0.4–0.9%), **trichomoniasis 0.6%** (0.4–0.8%), and **syphilis 0.48%** (0.3–0.7%). **Prevalence and incidence estimates varied by region and sex.**
- **Nearly one million new infections with curable STI each day.**

Women



Men



[Sex Transm Dis.](#) 2008 Jun;35(6):607-10. doi: 10.1097/OLQ.0b013e3181676bbd.

Prevalence of sexually transmitted infections among sexually active Jordanian females.

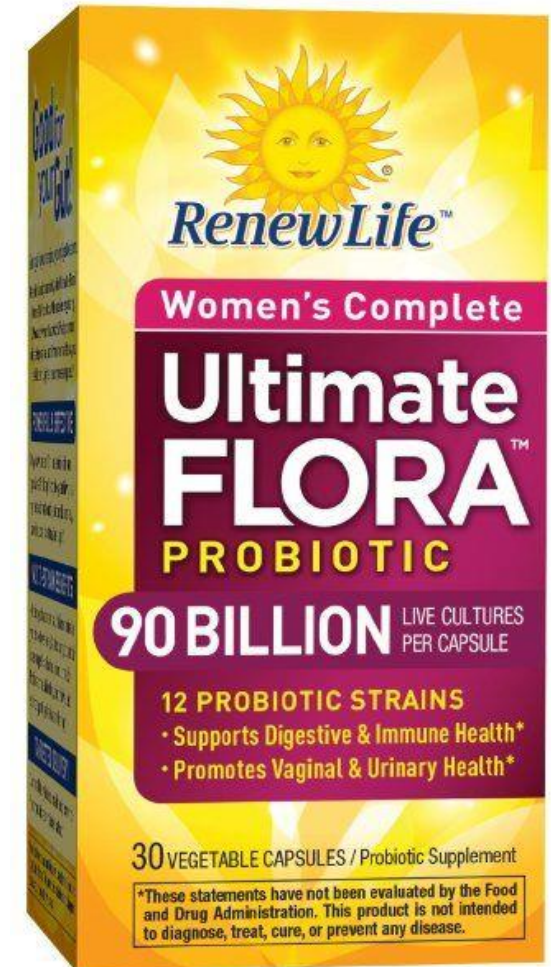
[Mahafzah AM](#)¹, [Al-Ramahi MQ](#), [Asa'd AM](#), [El-Khateeb MS](#).

RESULTS: The prevalence of *C. trachomatis* infection was 0.6% and 0.5%, among symptomatic and asymptomatic women respectively, that of *N. gonorrhoeae* was 0.9% and 2.2%, that of *T. pallidum* 0.0% and 0.0%, and that of *Tr. vaginalis* was 0.7% and 0.5%. These prevalence rates did not differ significantly between symptomatic and asymptomatic women.

CONCLUSIONS: Based on the low prevalence of sexually transmitted infections detected in this study among Jordanian women, the need for screening programs for such infections is questioned.

Bacterial vaginosis / etiology

- Bacterial vaginosis (BV) is a common cause of unusual vaginal discharge. BV isn't a sexually transmitted infection (STI), but it can increase your risk of getting an STI such as chlamydia
- Normal **vaginal flora** appears dominated by one or two species of ***Lactobacillus***. Rather than being due to a single organism, **BV** is caused by **complex changes in the balance** of the microbiological flora.
- Lactobacilli produce H₂O₂ which lowers the pH— the loss of these organisms permits an increase in pH and overgrowth of vaginal anaerobes (e.g. *Bacteroides*, *Mobiluncus*) .
- The newly found bacterial species degrade vaginal peptides into offensive- smelling products and promote discharge and exfoliation of the epithelial layers.

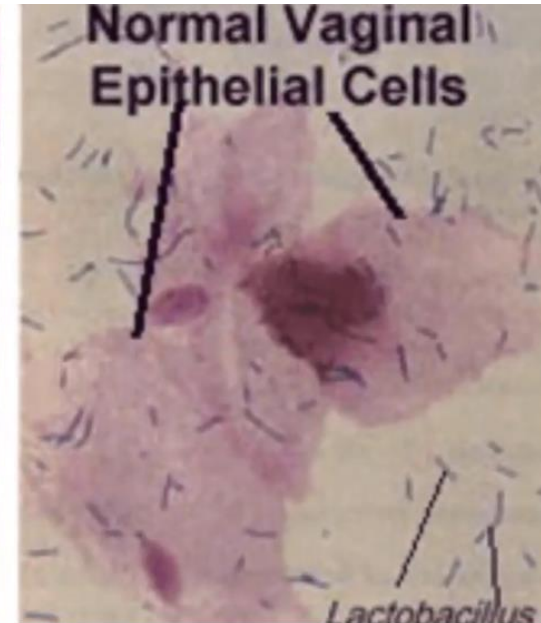
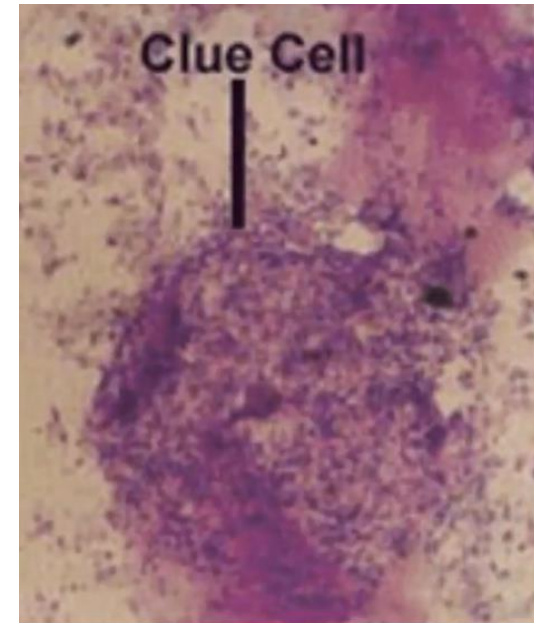
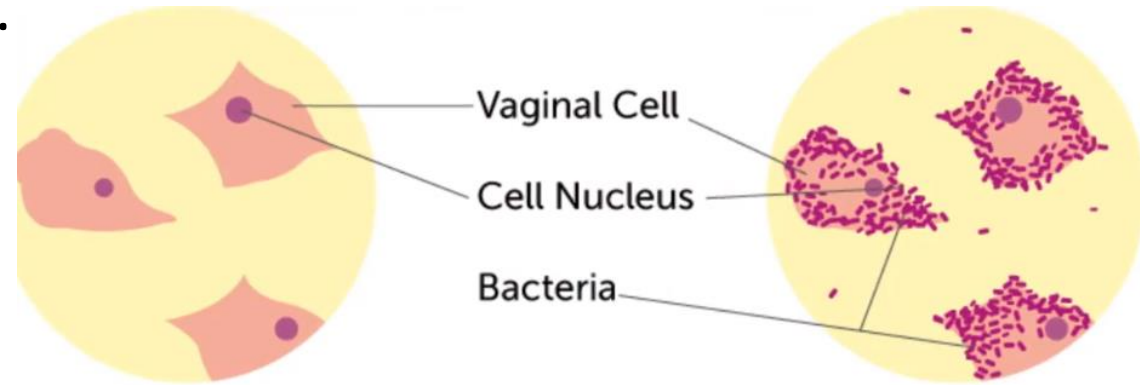


- Worldwide prevalence ranges from 11% to 48% in women of childbearing age.
- Risk factors for acquisition— **new or multiple sexual partners**, vaginal **douching**, smoking. It can occur in women **who have never had vaginal intercourse**.
- 50 to 75% of cases are asymptomatic. In symptomatic cases, there is **thin, white, fishy smelling discharge**, most noticeable after intercourse.
- Pregnant women with BV have a higher rate of preterm delivery and pregnancy complications.
- BV also **increases the risk of contracting other STDs** like HIV.

Bacterial vaginosis / diagnosis

The diagnosis of BV is usually based on **Amsel criteria**. The first three findings are sometimes also present in patients with trichomoniasis;

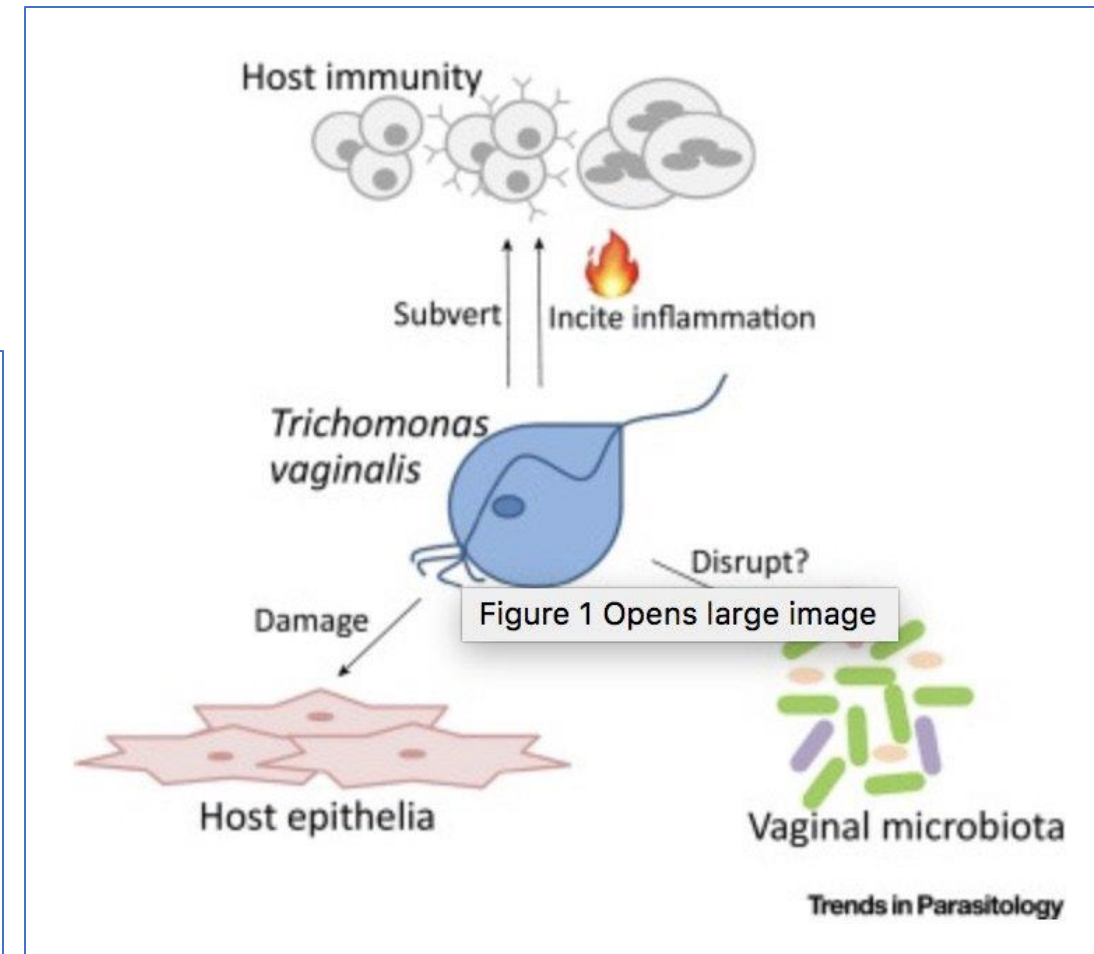
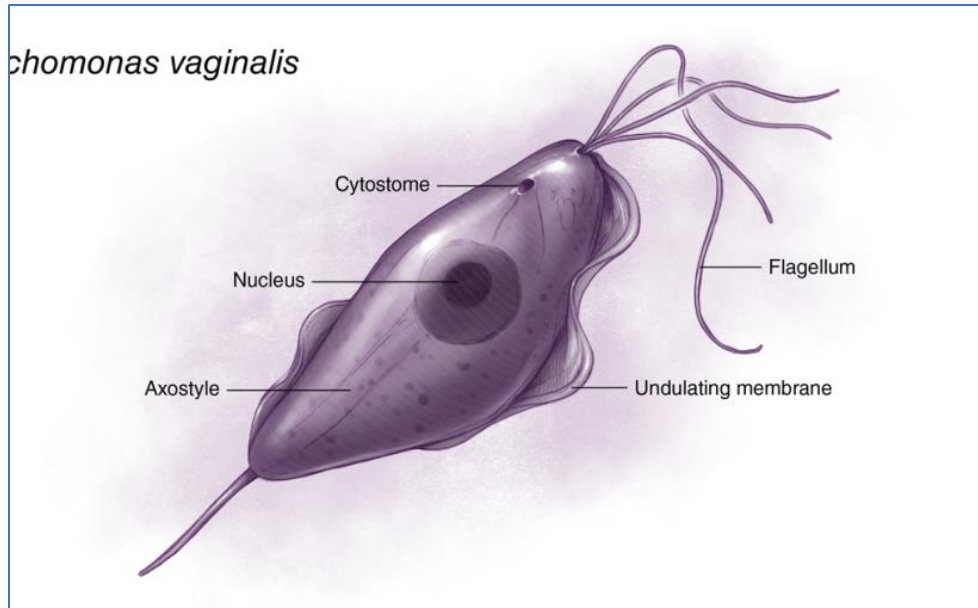
- homogeneous, **watery, white- grey discharge** coating the vaginal walls;
- **vaginal pH > 4.5**; (normal vaginal pH of estrogenized females typically ranges from 4.0 to 4.5)
- positive amine test— add 10% KOH to a sample of discharge— positive if produces a **fishy odour**;
- the presence of '**clue cells**' (epithelial cells studded with adherent coccobacilli) on a saline wet mount— the single best predictor of BV.



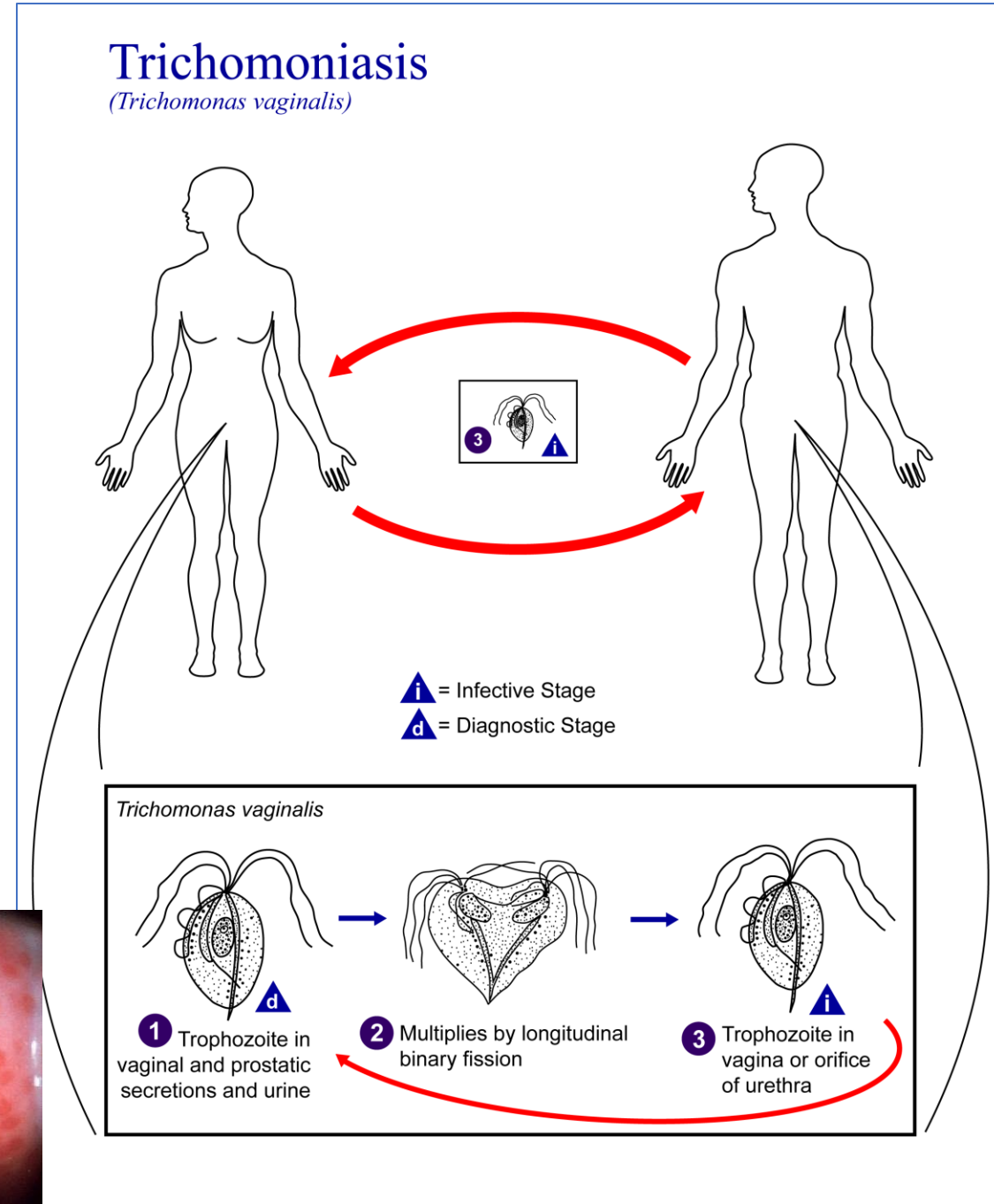
- Infection **resolves spontaneously** in **one- third** of cases.
- Treatment may **reduce the risk of acquiring other STDs**. And includes:
metronidazole— 500mg bd PO for 7 days or **clindamycin**— 300mg bd PO for 7 days
- Thirty per cent of **patients experience recurrence** within 3 months. A prolonged (e.g. 14 days) or alternative treatment course should be used in such patients.

Trichomoniasis / etiology

- An STI caused by the flagellated protozoan *T. vaginalis* (TV).
- TV pathogenesis include damage to host tissue mediated by parasite **killing of host cells**, **disruption** of steady-state **vaginal microbial ecology**, and eliciting inflammation by **activating the host immune response**.

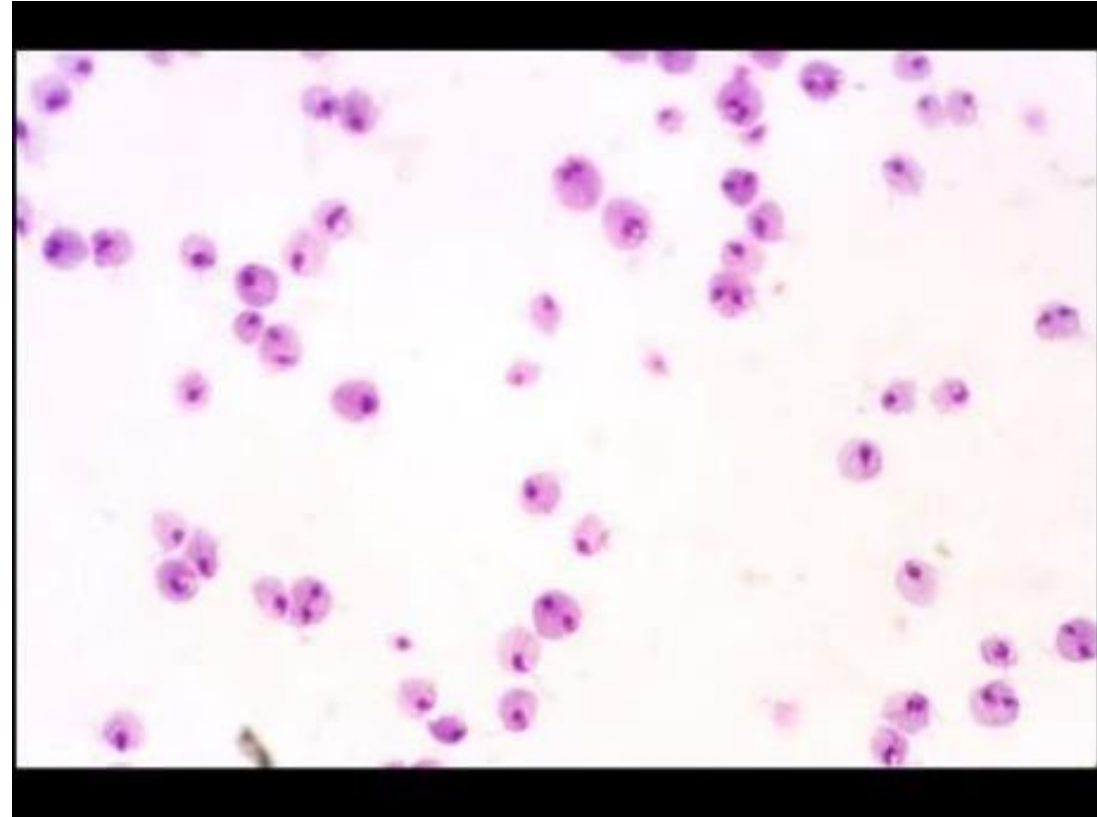


- Transmission is by sexual contact, and its incidence is highest in women with multiple sexual partners and those with other STIs.
- Infection is asymptomatic in 10– 50% of women and 15– 50% of men
- Symptoms include frothy, yellow **vaginal discharge** (may be **itchy** and **smelly**), **dyspareunia**, **dysuria**, and lower abdominal pain.
- punctate haemorrhages on the cervix ('**strawberry cervix**') in 2% of patients
- Can lead to **urethritis** in men.



Trichomoniasis / diagnosis and treatment

- **Microscopy**— phase- contrast or dark- ground microscopy of wet preparation of genital specimens will demonstrate the **motile flagellated protozoans** in 48– 80% of infected women and 50– 90% of infected men.
- Point- of- care tests, e.g. OSOMR *Trichomonas* rapid test has a sensitivity of 80– 94% and a specificity of >95%.
- **NAATs** offer the highest sensitivity and are becoming the gold standard
- **Metronidazole** 2g stat dose or tinidazole 2g stat dose. Partners and asymptomatic individuals should be treated



Vulvovaginal candidiasis / etiology

- Candidiasis is an infection caused by **Candida albicans**, which is an opportunistic pathogenic yeast that is a common member of the human **gut flora**.
- *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.
- Candidal infection is uncommon in prepubertal women



Vulvovaginal candidiasis

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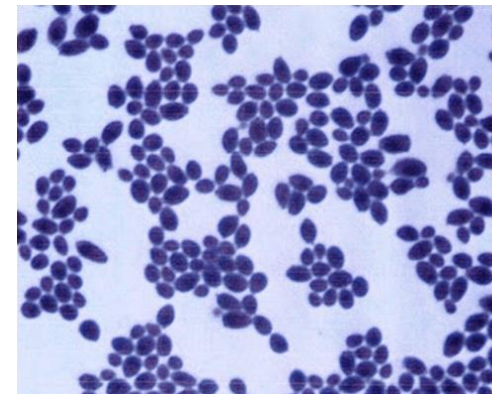
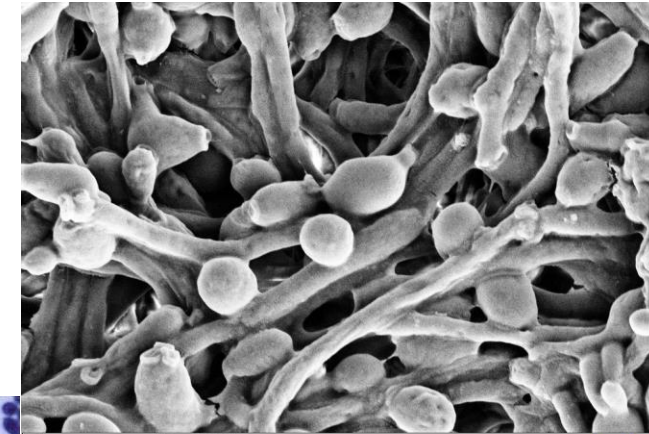
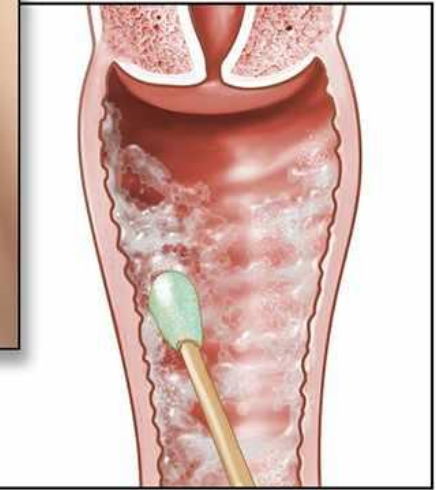


Image Courtesy of M. McGinnis
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Vulvovaginal candidiasis / signs and symptoms

- ***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**.

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 to azole 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

Common clinical findings of vaginitis

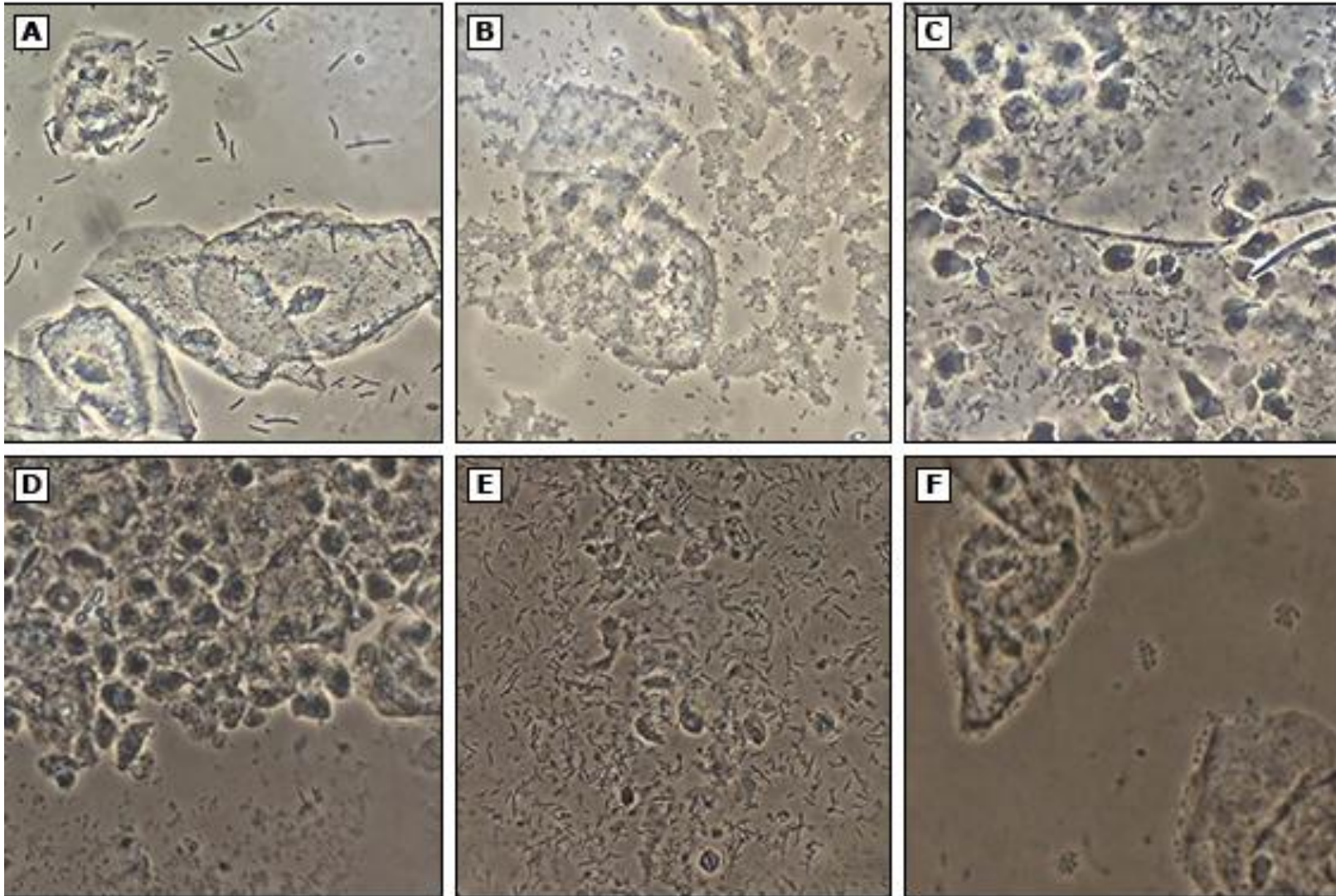
Parameter	Normal findings	Vulvovaginal candidiasis	Bacterial vaginosis	Trichomoniasis
Symptoms	None or mild, transient	Pruritus, soreness, dyspareunia	Malodorous discharge, no dyspareunia	Malodorous discharge, burning, postcoital bleeding, dyspareunia, dysuria
Signs	Normal vaginal discharge consists of 1 to 4 mL fluid (per 24 hours), which is white or transparent, thin or thick, and mostly odorless	Vulvar erythema and/or edema Discharge may be white and clumpy and may or may not adhere to vagina	Off-white/gray thin discharge that coats the vagina	Thin green-yellow discharge, vulvovaginal erythema
Vaginal pH	4.0 to 4.5	4.0 to 4.5	>4.5	5.0 to 6.0*
Amine test	Negative	Negative	Positive (in 70 to 80% of patients)	Often positive
Saline microscopy	PMN:EC ratio <1; rods dominate; squames +++	PMN:EC ratio <1; rods dominate; squames +++; pseudohyphae (present in approximately 40% of patients); budding yeast for nonalbicans <i>Candida</i>	PMN:EC <1; loss of rods; increased coccobacilli; clue cells comprise at least 20% of epithelial cells (present in >90% of patients)	PMN ++++; mixed flora; motile trichomonads (present in approximately 60% of patients)

10% potassium hydroxide microscopy	Negative	Pseudohyphae (in approximately 70% of patients)	Negative	Negative
Other tests	–	If microscopy nondiagnostic: <ul style="list-style-type: none">▪ Culture▪ Nucleic acid amplification test▪ DNA hybridization probe	Quantitative microscopy (eg, Nugent criteria, Hay/Ison criteria) Nucleic acid amplification test DNA hybridization probe Culture of no value	If microscopy nondiagnostic: <ul style="list-style-type: none">▪ Culture▪ Rapid antigen test▪ Nucleic acid amplification test▪ DNA hybridization probe
Differential diagnosis	Physiologic leukorrhea	Contact irritant or allergic vulvar dermatitis, chemical irritation, focal vulvitis (vulvodynia)	Elevated pH in trichomoniasis, atrophic vaginitis, and desquamative inflammatory vaginitis	Purulent vaginitis, desquamative inflammatory vaginitis, atrophic vaginitis, erosive lichen planus

PMN: polymorphonuclear leukocytes; EC: vaginal epithelial cells.

* In some cases vaginal pH can be normal.

Examples of common findings on wet mount microscopy of vaginal discharge



- (A) Normal (presence of pleomorphic lactobacilli and superficial cells).
- (B) Bacterial vaginosis (clue cells, absent lactobacilli, presence of granular flora).
- (C) Candida (mycelium and blastospores, moderate inflammation, lactobacilli grade IIa; the dimorphism is suggestive of *C. albicans*).
- (D) Candida and bacterial vaginosis (lactobacilli absent, granular flora, severe inflammation, blastospores).
- (E) Cytolytic vaginosis (abundant lactobacilli, bare nuclei, and cytoplasmatic debris).
- (F) Desquamative inflammatory vaginitis (also referred to as aerobic vaginitis).
- (G) Desquamative inflammatory vaginitis (severe AV; lactobacilli grade III, cocci, atrophy, and moderate inflammation).
- (H) Trichomoniasis and bacterial vaginosis (clue cells, granular flora, lactobacilli absent, inflammation, *T. vaginalis*).
- (I) Vaginal atrophy (lactobacilli absent, cellular scarcity, parabasal cells).
- (J) Leptothrix.
- (K) Cervical mucus.
- (L) Bacterial vaginosis and sperm (sperm can be confused with blastospores, especially after the loss of the tail).

From: Vieira-Baptista P, Grincevičienė S, Oliveira C, et al. The International Society for the Study of Vulvovaginal Disease Vaginal Wet Mount Microscopy Guidelines: How to Perform, Applications, and Interpretation. *J Low Genit Tract Dis* 2021; 25:172. DOI: [10.1097/LGT.0000000000000595](https://doi.org/10.1097/LGT.0000000000000595). Copyright © 2021 ASCCP. Reproduced with permission from Wolters Kluwer Health. Unauthorized reproduction of this material is prohibited.

UpToDa

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

Further reading:

- UptoDate references in slide notes.
- 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