Candidiasis and Trichomoniasis

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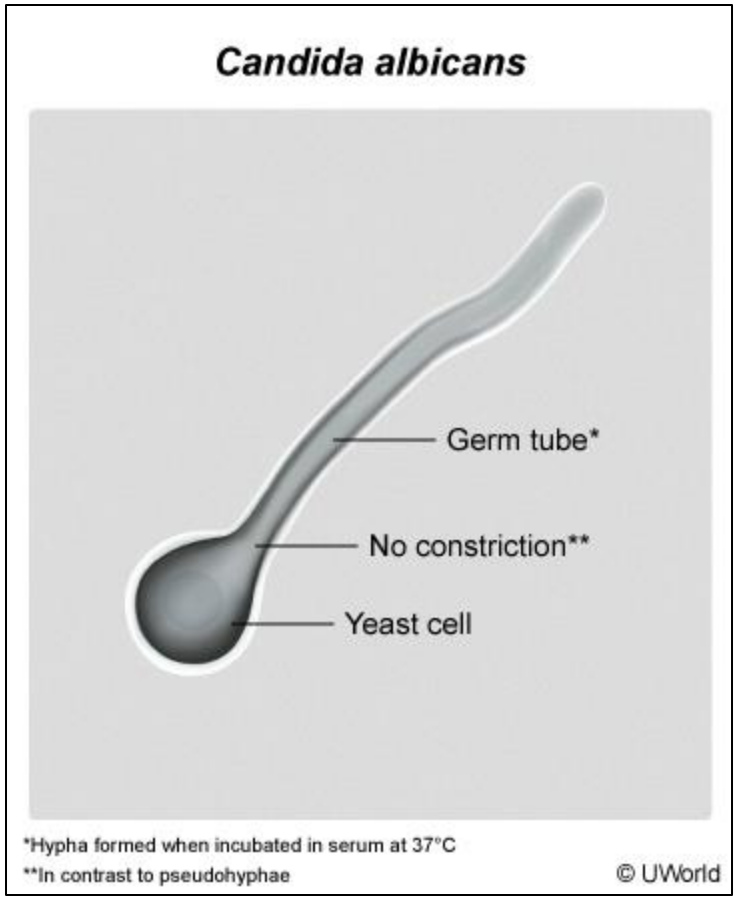
Candidiasis - Introduction

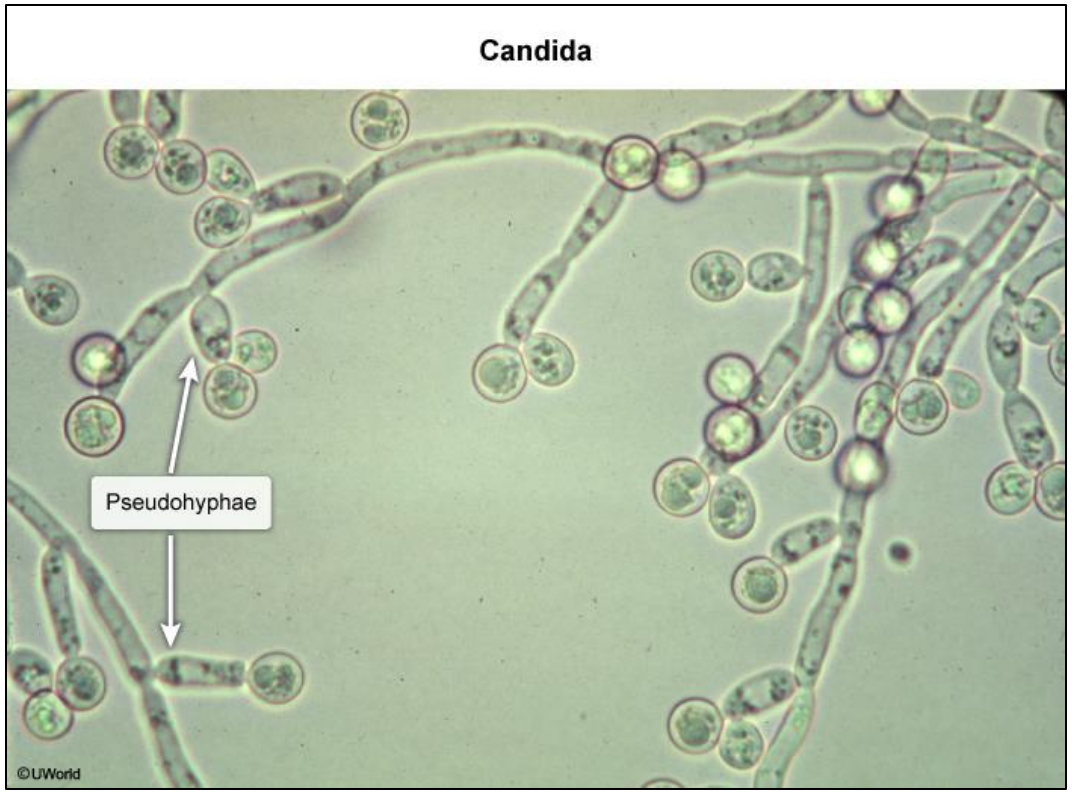
- Candida infections encompass a broad spectrum of clinical syndromes caused by yeasts of the *Candida* genus, most notably *C albicans*. *Candida* can develop as:
  - Budding yeasts.
  - Pseudohyphae (image next slide): filament-like structures, resulting from the elongation of budding yeast, with constrictions.
  - Hyphae: filamentous structures separated by septae (rather than constrictions).

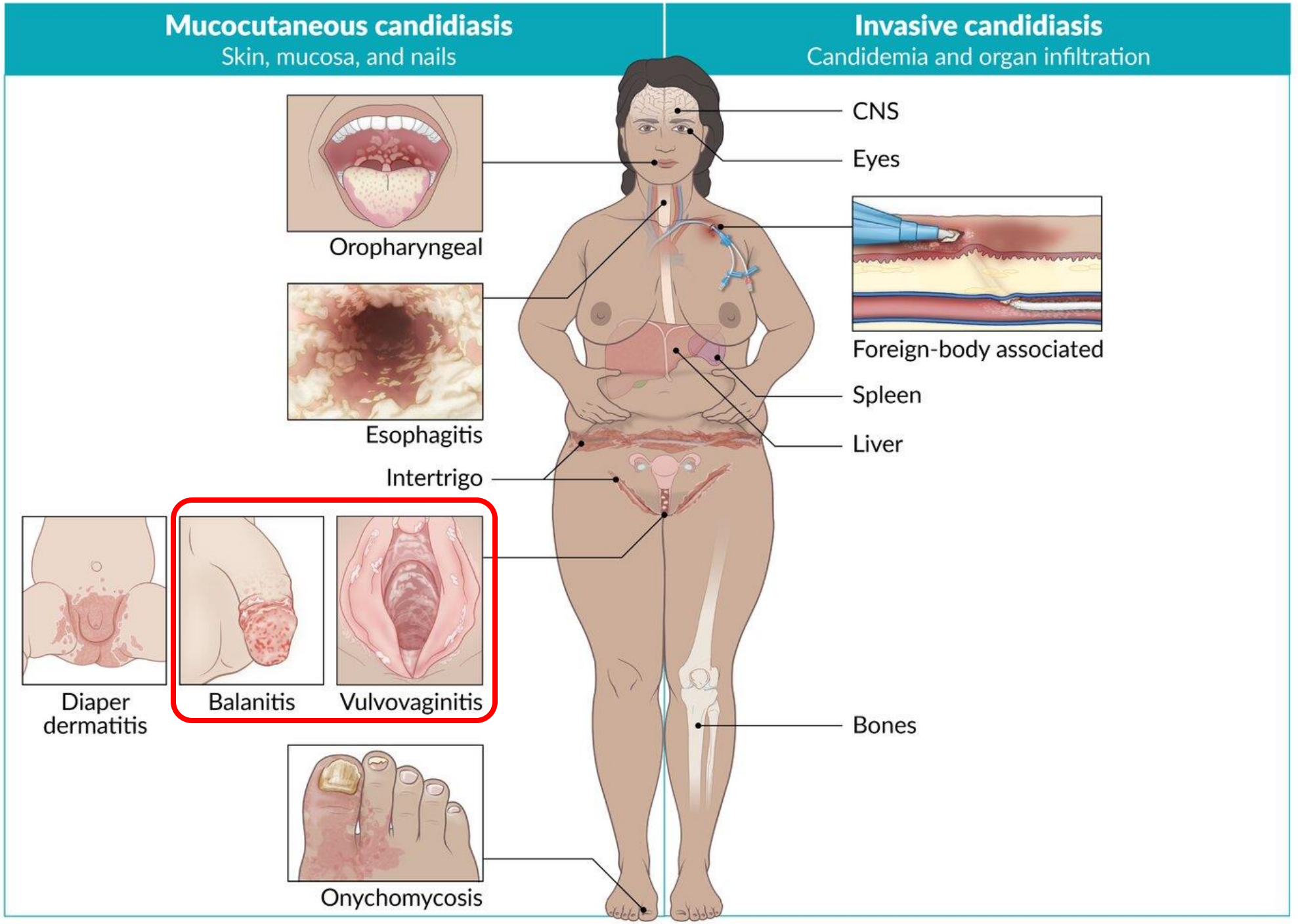


Candidiasis - Introduction

These fungi are common **commensals**, residing harmlessly on human mucosal surfaces, skin, and within the gastrointestinal and genitourinary tracts.

However, disruptions in the local microbial flora, damage to mucosal integrity, or **weakened immunity can allow Candida to proliferate and become pathogenic**.




Mucocutaneous candidiasis
Skin, mucosa, and nails
Invasive candidiasis
Candidemia and organ infiltration
Oropharyngeal
Esophagitis
Intertrigo
Diaper dermatitis
Balanitis
Vulvovaginitis
Onychomycosis
CNS
Eyes
Foreign-body associated
Spleen
Liver
Bones

Clinical manifestations

- Vulvovaginal candidiasis
- Cutaneous candidiasis (intertrigo, balanitis)
- Oropharyngeal candidiasis (thrush)
- Esophageal candidiasis
- Invasive candidiasis (disseminated infection)
- Candiduria
- Chronic mucocutaneous candidiasis

Vulvovaginal candidiasis - Introduction

- Vulvovaginal candidiasis (VVC), commonly known as a yeast infection, is an inflammatory vulvar and vaginal infection caused by overgrowth of fungal *Candida* species, most commonly *Candida albicans*.

- Although *Candida* spp. are part of the normal vaginal flora, overgrowth can lead to symptomatic infection.

Vulvovaginal candidiasis - Pathophysiology

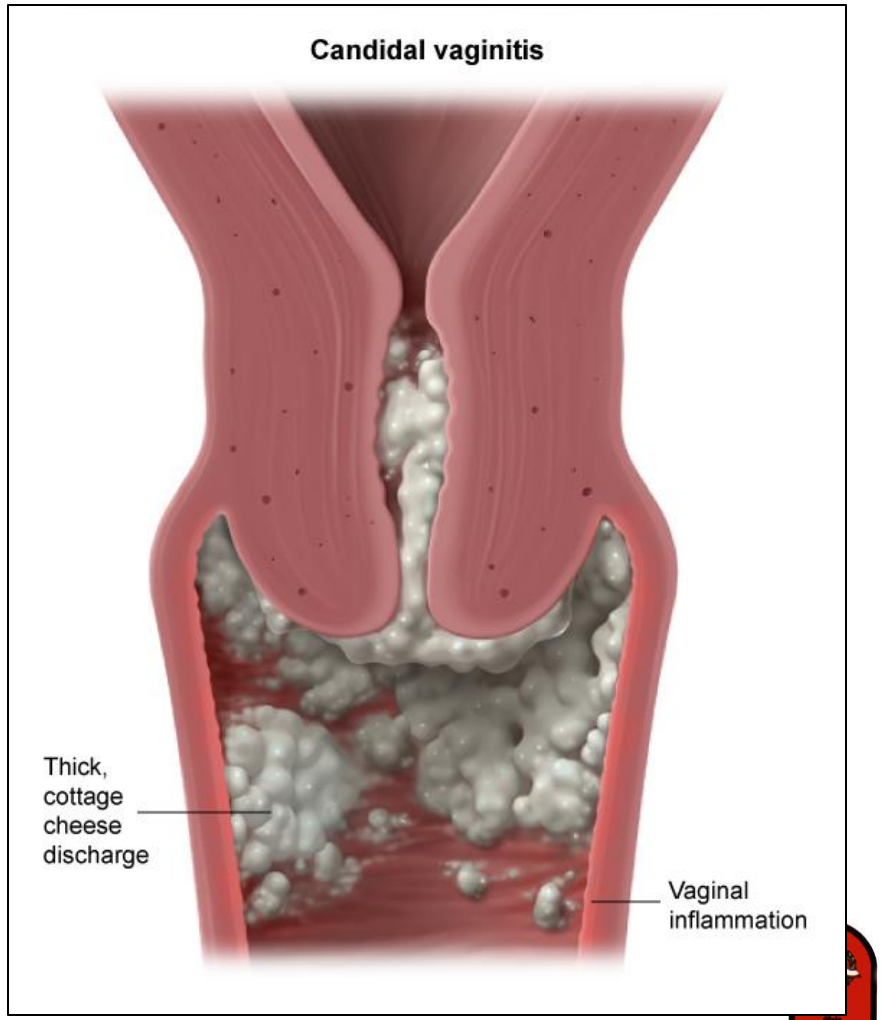
- *Candida* fungal spp. are part of the normal vaginal flora and exist in balance with the predominant bacteria of the vaginal microbiome, gram-positive *Lactobacillus* spp.
- Alterations in immune function or in the balance of the vaginal microbiome allow for excessive *Candida* proliferation.
- Symptomatic infection develops when pseudohyphae invade the vaginal epithelium, leading to inflammation.

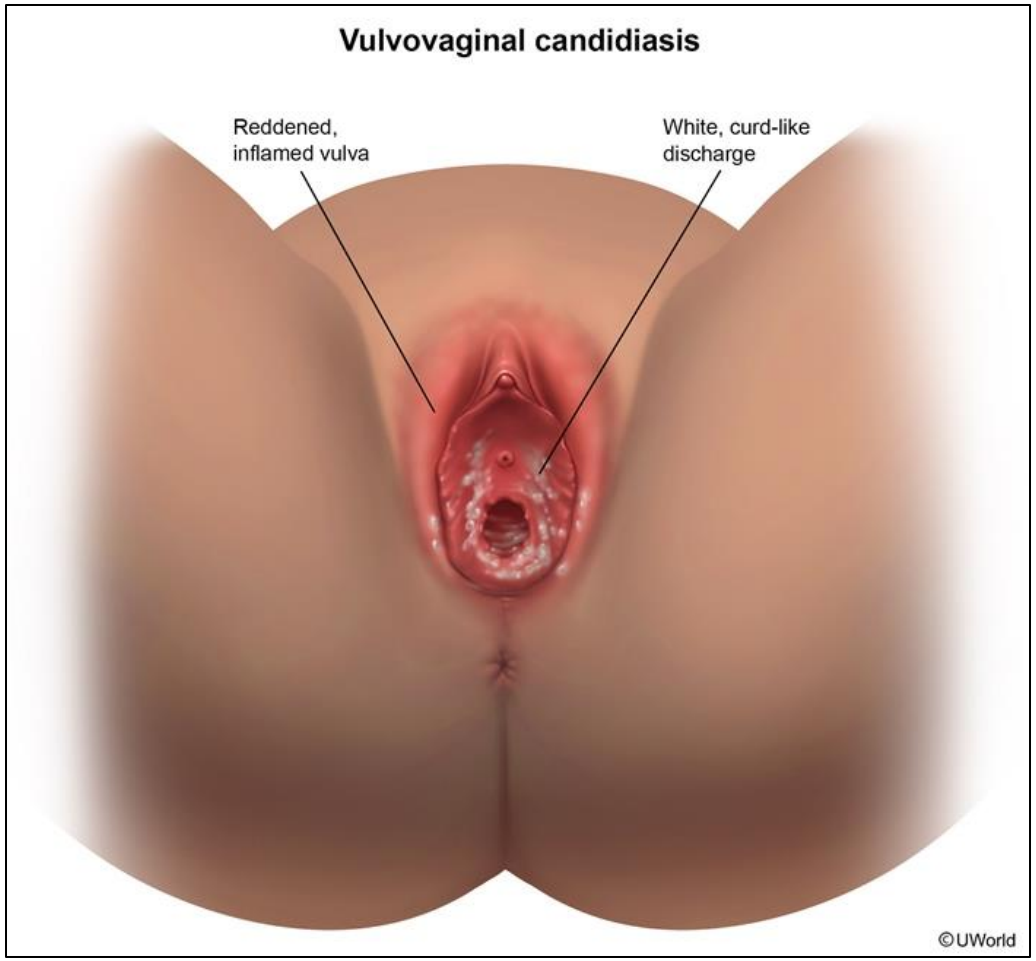
Vulvovaginal candidiasis - Risk factors

- **Antibiotic use** reduces the number of *lactobacilli*, thereby disrupting the normal flora and allowing for unchecked *Candida* growth.
- **High estrogen levels** (eg, pregnancy, postmenopausal estrogen therapy) increase glycogen content (used by *Candida* spp.) within vaginal epithelial cells.
- **Diabetes mellitus** (and treatment with sodium-glucose cotransporter-2 inhibitors) results in elevated glucose, which facilitates adhesion of *Candida* to epithelial cells.
- **Immunosuppression** (ie, HIV/AIDS, corticosteroid use) impairs regulation of *Candida* spp. proliferation.

Vulvovaginal candidiasis - Clinical presentation

- VVC commonly presents with:
  - **Vulvovaginal pruritus** that can lead to excoriations.
  - **Vaginal discharge**, which is classically described as **thick, white, cottage cheese–like discharge**; however, this can vary in presentation to include scant, thin, or watery discharge.
  - **Vulvovaginal inflammation** with erythema and edema of the vulva and vaginal mucosa, leading to dysuria and dyspareunia.





Candidal vulvovaginitis

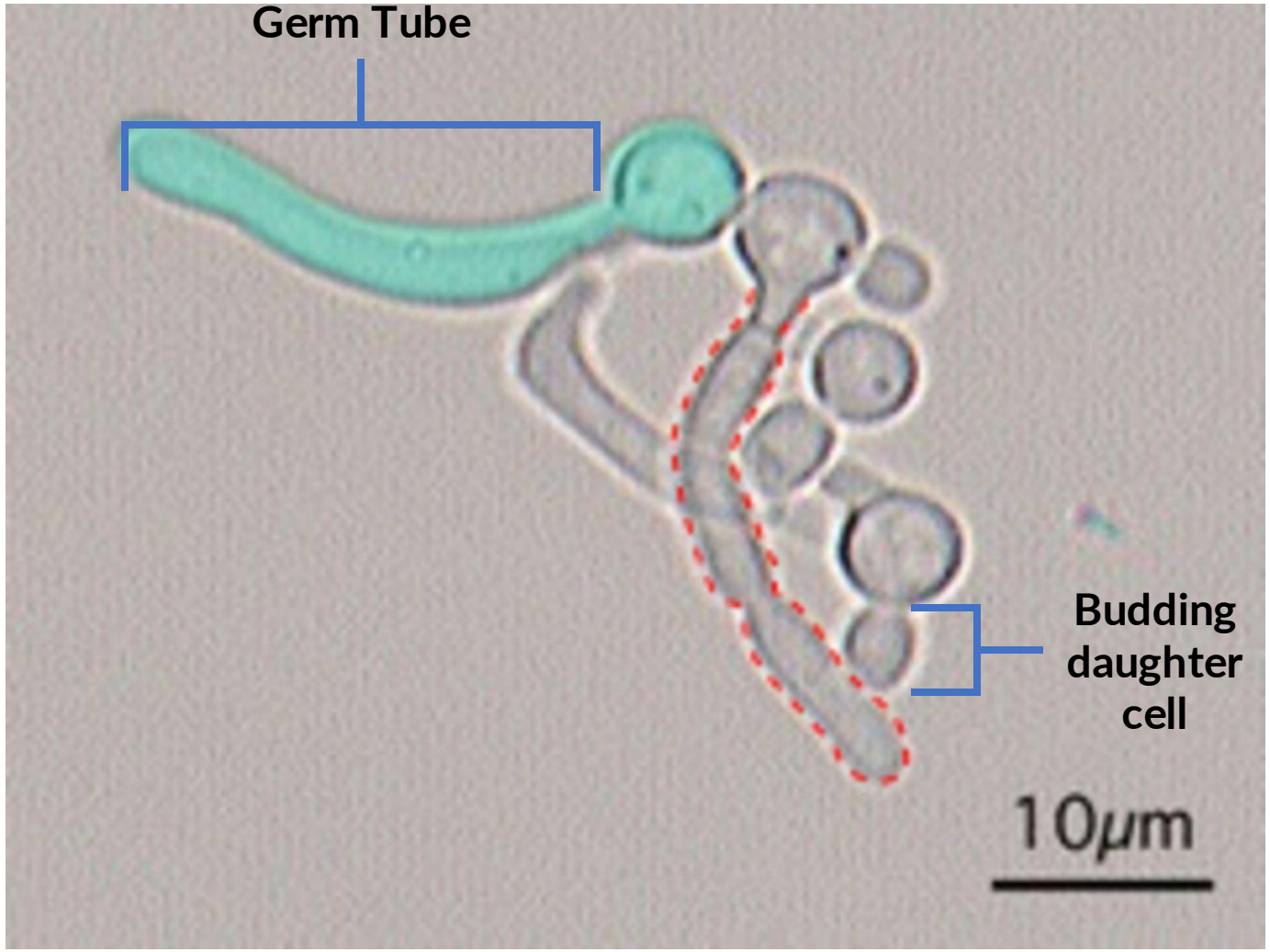
Vaginal cavity of a woman presenting with vaginal pruritus and white odorless vaginal discharge

White, cottage cheese-like discharge can be seen adhering loosely to the vaginal walls, which have patchy areas of inflammation.

Vulvovaginal candidiasis - Diagnosis and laboratory evaluation

- Diagnosis of VVC is often **made clinically with laboratory testing**. Physical examination often shows thick, white discharge with vulvar and vaginal erythema (figure next slide). Findings are most often confirmed using office-based tests that provide immediate results:
  - Microscopy with potassium hydroxide (KOH) wet mount preparation: The KOH lyses epithelial cells to reveal budding yeast, pseudohyphae, and hyphae (image).
  - Vaginal pH: Normal pH ranges from 4.0 to 4.5.
  - Vaginal cultures can also be obtained; however, because *Candida* spp. are part of the normal vaginal flora, a positive culture does not always indicate infection.

Overlay



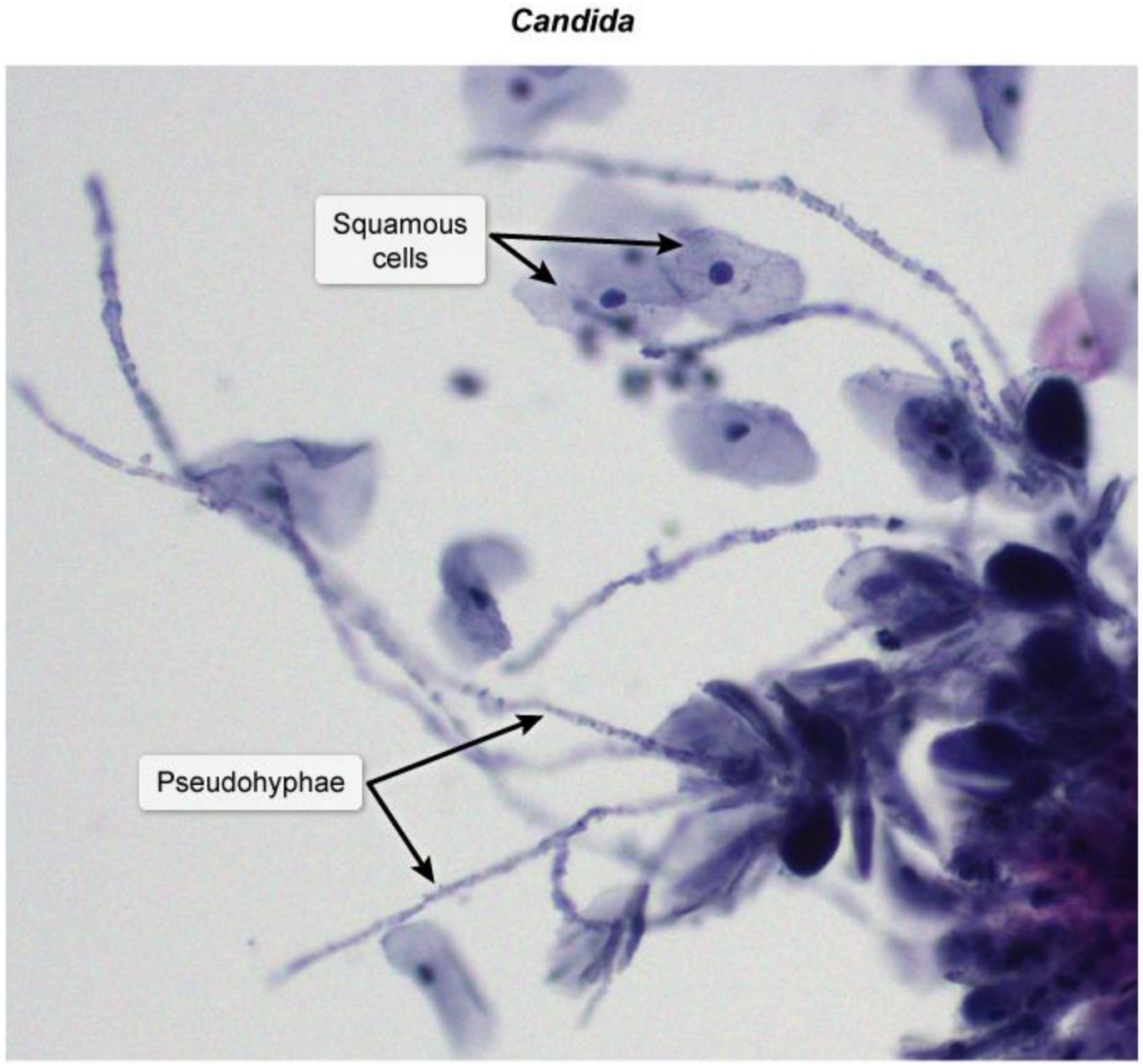
Candida albicans

- Photomicrograph of fungus germination (KOH preparation, 600x)
- Mother cells (blastospores (budding yeast); green overlay) produce a hyphal outgrowth of germ tubes (budding; dashed red outline).
- Budding is suggestive of active candida infection.

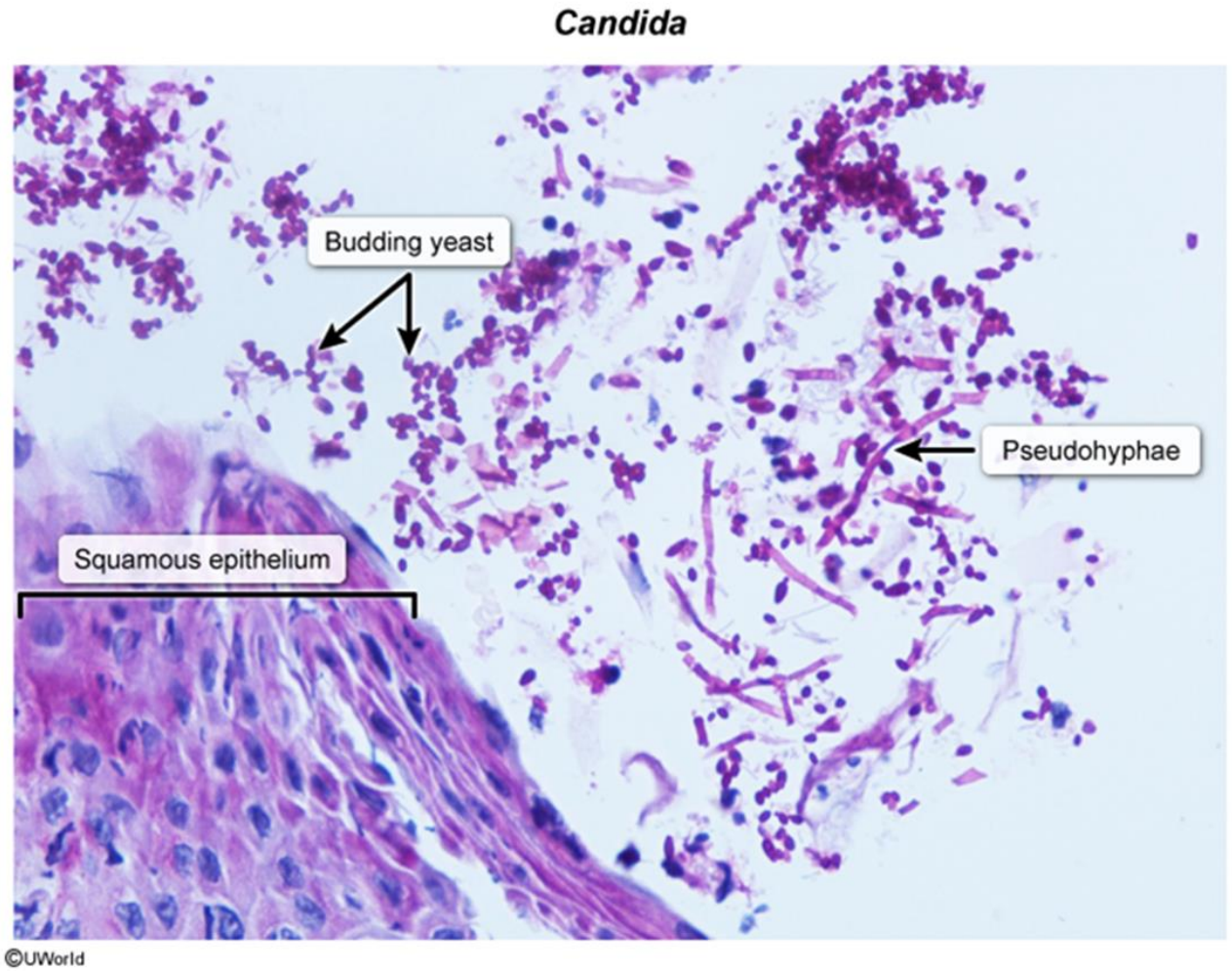
Overlay

Candida albicans

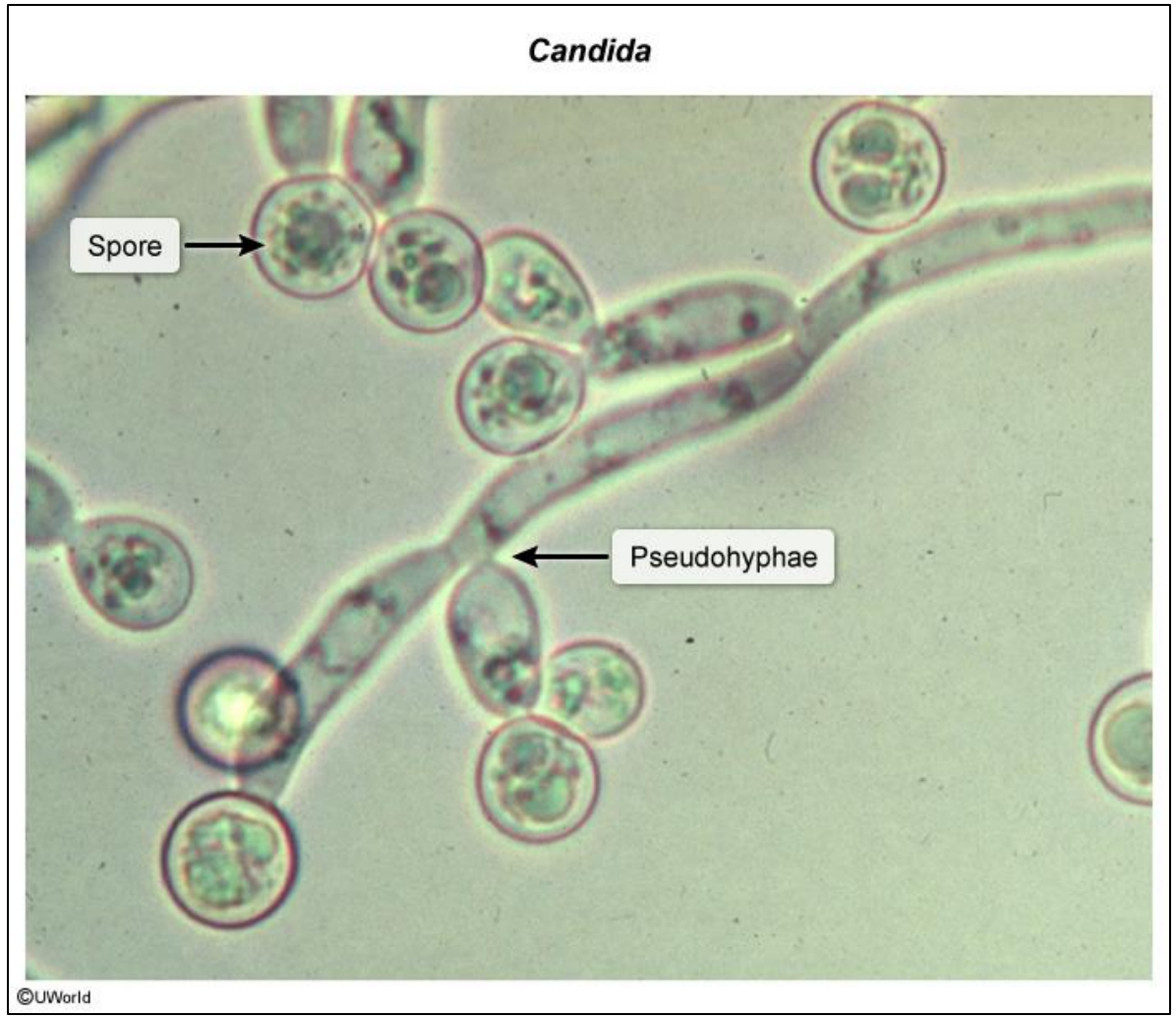
- Incubating the sample in human serum at 37 C for 2-3 hours (ie, **germ tube test**) leads to the formation of **true hyphae**, projections from the yeast with **no constrictions**.
- A positive germ tube test is diagnostic of *C albicans* and distinguishes it from other *Candida* species (eg, *C tropicalis*, *C glabrata*).

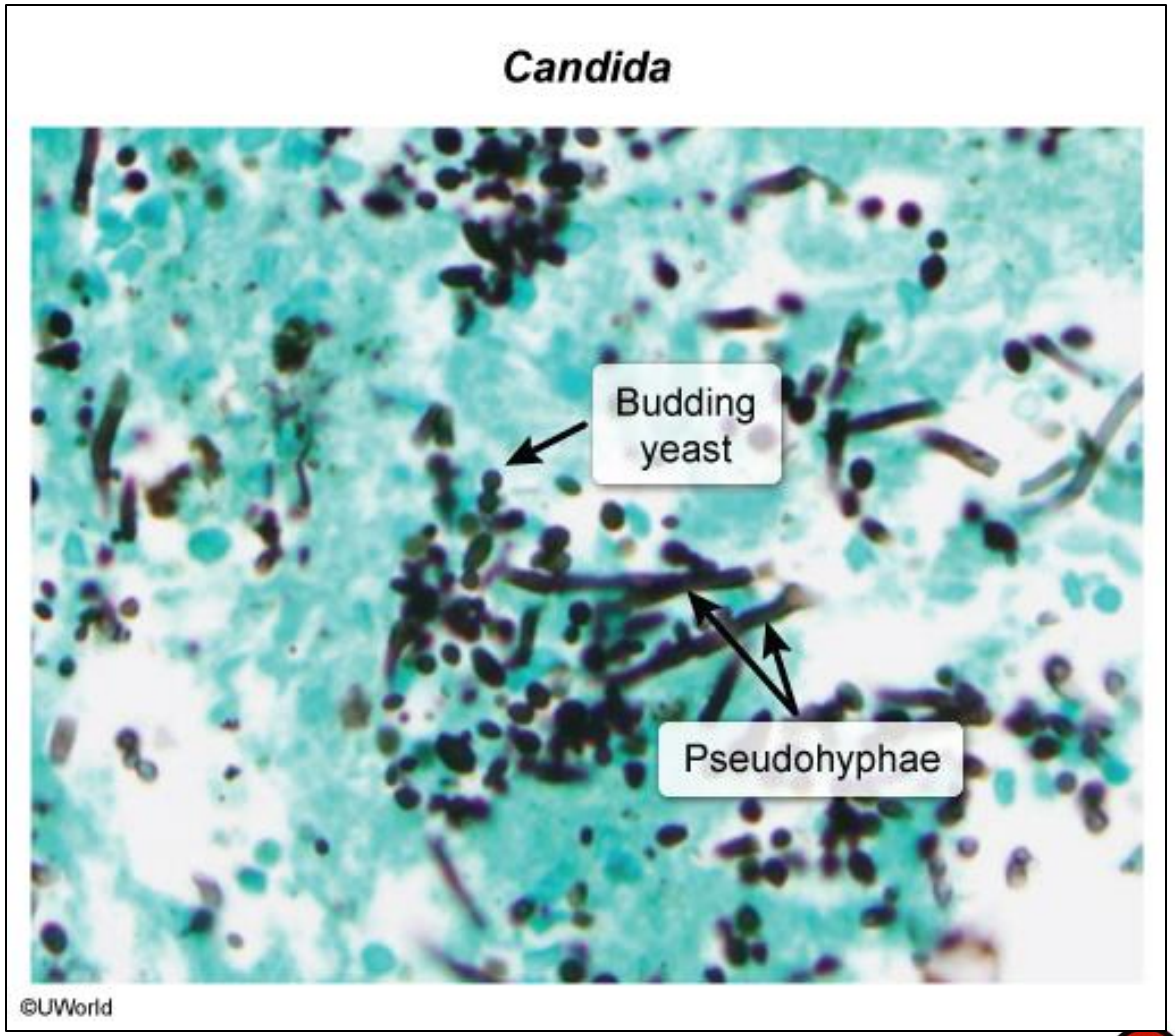


Pseudohyphae seen in Candida vaginitis, which would present with thick, white vaginal discharge and associated vaginal inflammation (eg, vaginal erythema, pruritus).



- The morphology of *Candida* includes branching **pseudohyphae** with **blastospores** (budding yeast).
- Pseudohyphae, an important diagnostic clue, form when yeasts do not separate after budding, creating a sausage-like chain of elongated yeasts joined together end-to-end with constrictions.
- Incubating the sample in human serum at 37 C for 2-3 hours (ie, **germ tube test**) leads to the formation of **true hyphae**, projections from the yeast with **no constrictions**. A positive germ tube test is diagnostic of *C albicans* and distinguishes it from other *Candida* species (eg, *C tropicalis*, *C glabrata*)
- Generally, growth at 37°C at neutral pH favours pseudohyphae, whereas **hyphae are induced by the presence of serum**.


Candida
Spore
Pseudohyphae
©UWorld


Candida
Budding yeast
Pseudohyphae
©UWorld

Treatment

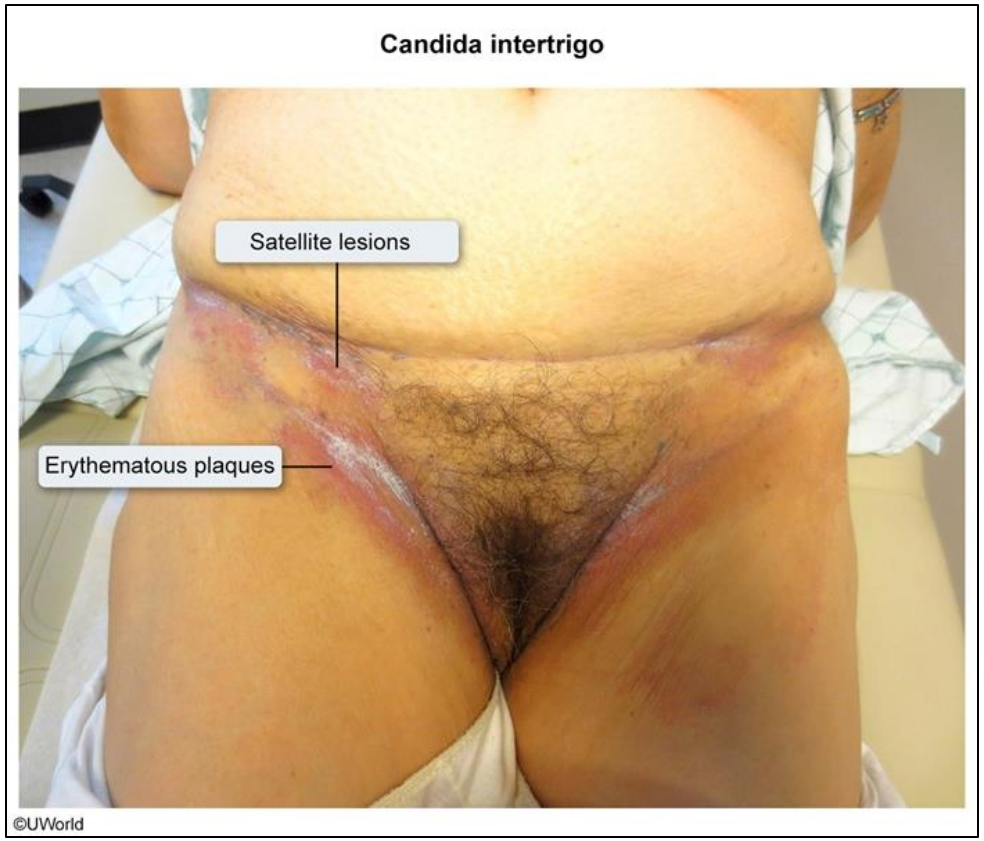
The mainstay of VVC treatment is with oral or topical antifungals:

- **Fluconazole**, which is the most commonly used oral treatment and generally requires only a single dose for complete symptom resolution → decrease ergosterol synthesis and disrupt fungal cellular membrane formation.
- Intravaginal topical antifungals (eg, clotrimazole, miconazole)

Vulvovaginal candidiasis	
Risk factors	• Diabetes mellitus • Immunosuppression • Pregnancy • Antibiotic use
Examination	 • Thick, cottage cheese–like discharge • Vaginal inflammation
Laboratory findings	 • Normal pH (3.8-4.5) • Pseudohyphae
Treatment	• Fluconazole

Cutaneous candidiasis (intertrigo, balanitis)

- Intertrigo consists of erythematous ("beefy red") plaques within skin folds (inguinal, inframammary, axillary).
- It is common in patients with obesity, diabetes mellitus, and immunosuppressive conditions.
- Diagnosis is typically clinical, although unclear cases can be confirmed with KOH scraping showing pseudohyphae.



Cutaneous candidiasis (intertrigo, balanitis)

- Balanitis is inflammation of the glans penis, often in uncircumcised boys or men.
- Thick, white discharge may be present.
- Patients with recurrent infection should be screened for diabetes mellitus.

Trichomonas vaginalis

Introduction

- Trichomoniasis is a common sexually transmitted infection (STI) that affects both men and women and is caused by *Trichomonas vaginalis*, a motile, flagellated protozoan.
- The majority of patients are asymptomatic, but trichomoniasis can cause vaginitis and cervicitis in women and urethritis in men.

Pathogenesis and risk factors

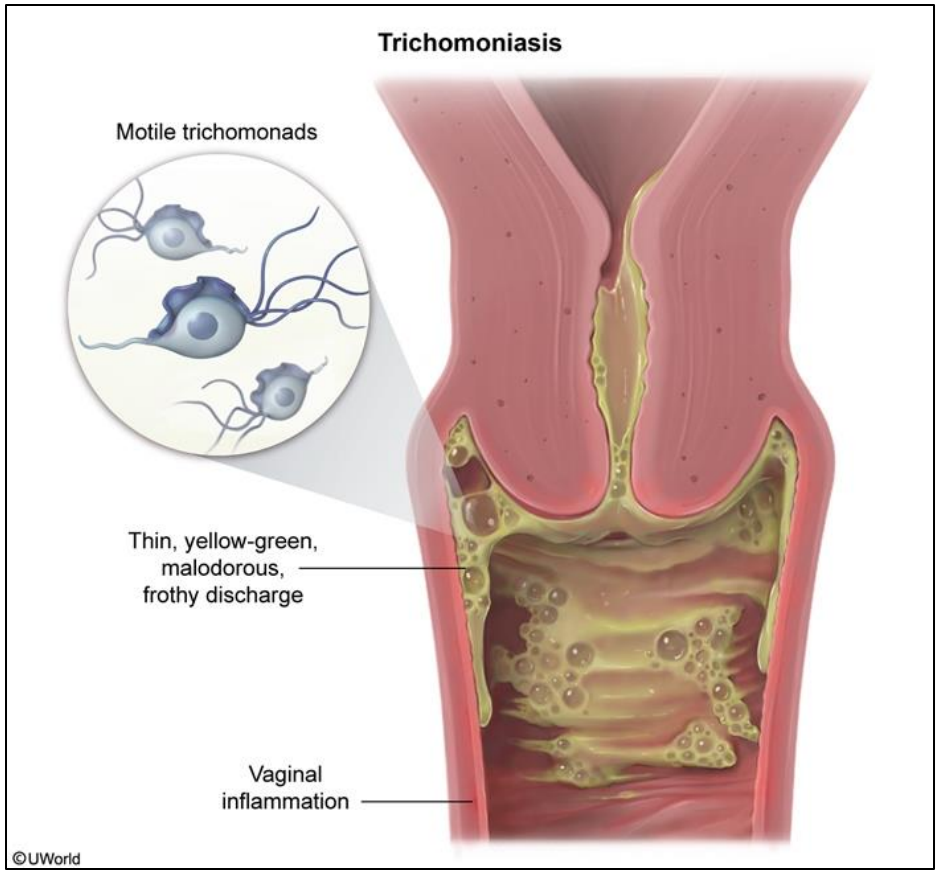
- *T vaginalis* is a sexually transmitted flagellated protozoan that primarily infects the squamous epithelium of the urogenital tract (eg, vagina, urethra, cervix, prostate). The adherence of *T vaginalis* to the epithelial cells causes direct cytotoxic cell damage and an inflammatory response, contributing to the symptoms of vaginitis in women and urethritis in men.
- Risk factors for trichomoniasis include high-risk sexual behaviors (similar to other STIs) and include a history of other STIs, unprotected sexual intercourse, and multiple sexual partners.

Clinical presentation

- Trichomoniasis is most often asymptomatic. However, if symptoms are present, they differ slightly between men and women.

Clinical presentation - Women

- Symptoms in women are due to cervicitis, vaginitis, and urethritis and may include:
  - Malodorous, **frothy, greenish-yellow vaginal discharge**
  - Vulvovaginal pruritus
  - Dysuria, urinary frequency (due to infection of the urethra)
  - Dyspareunia
  - Postcoital bleeding (due to capillary hemorrhages on the cervix and vagina [ie, **"strawberry" cervix**])

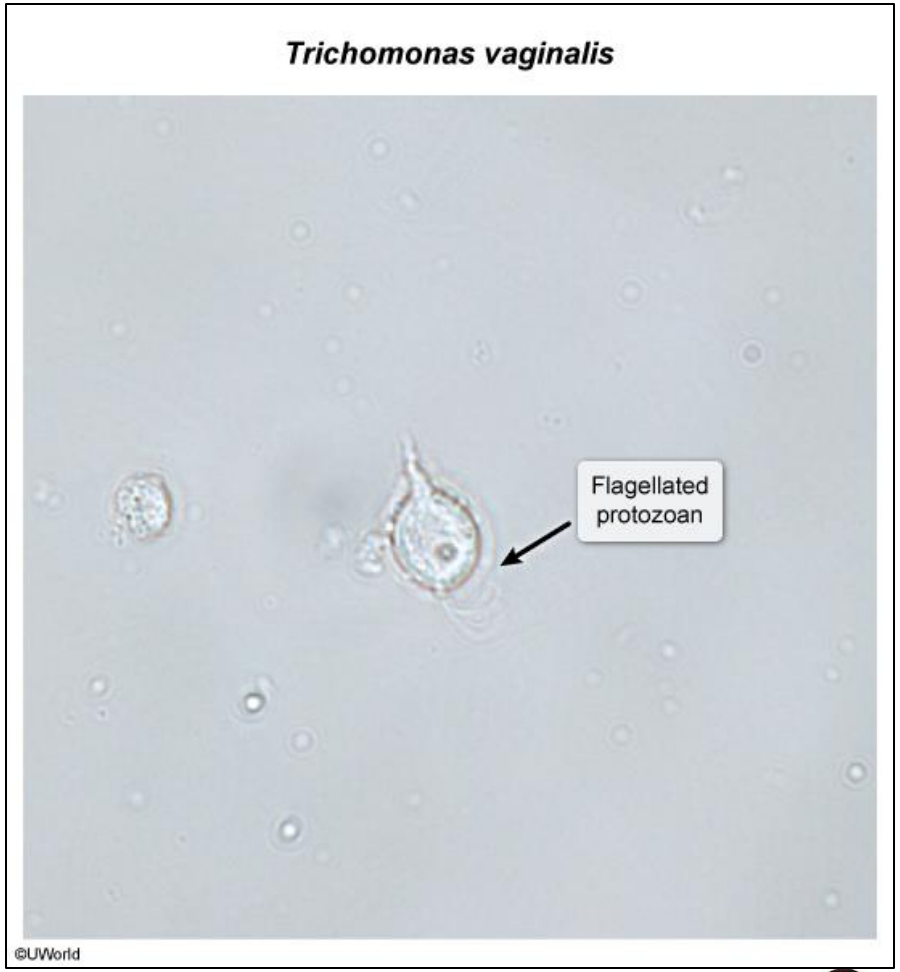


Clinical presentation - Men

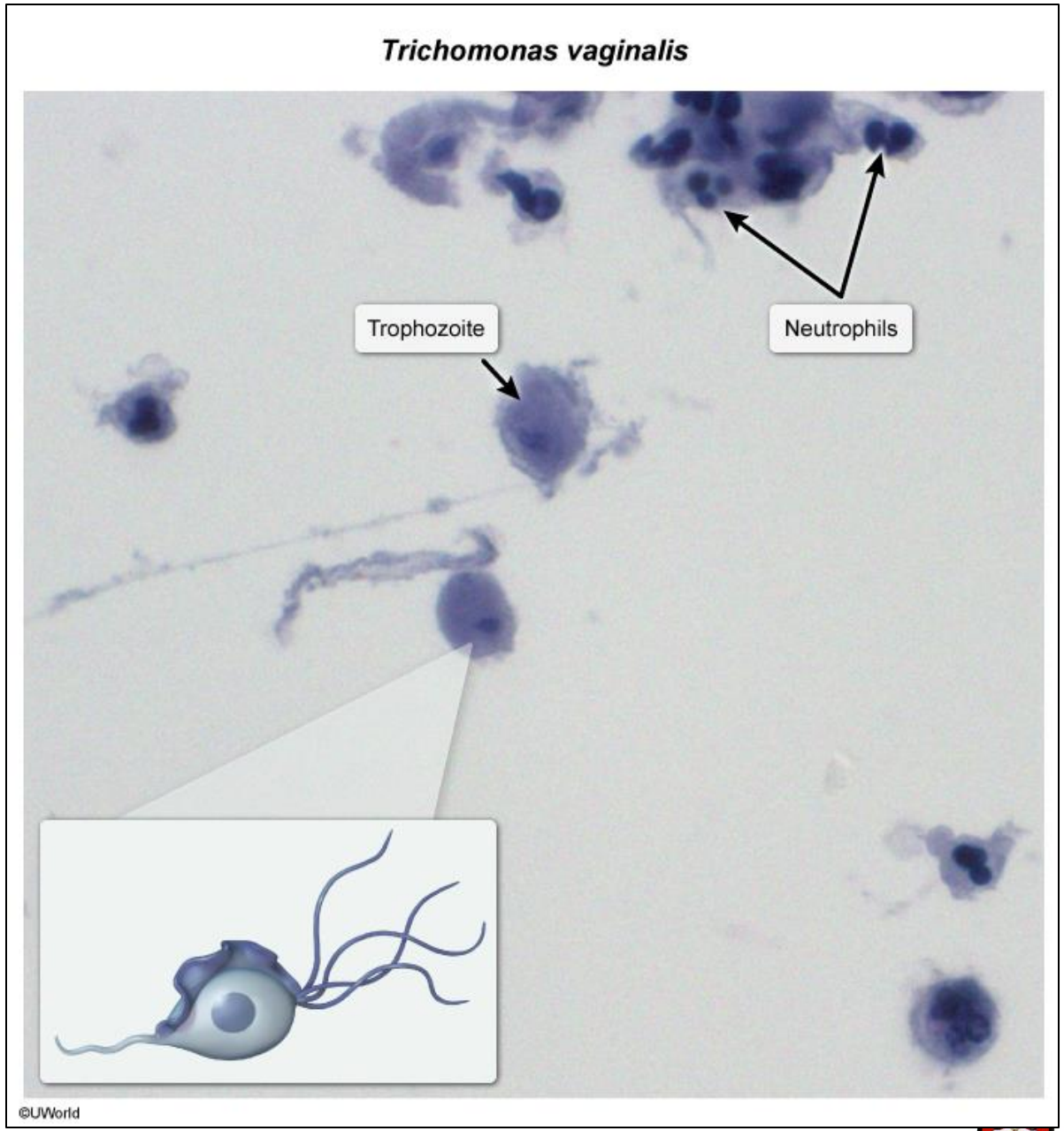
- Symptoms in men are due to urethritis and may include:
  - **Clear-mucopurulent urethral discharge**
  - Dysuria
  - Prostatitis, epididymitis (rare)

Diagnosis and laboratory evaluation

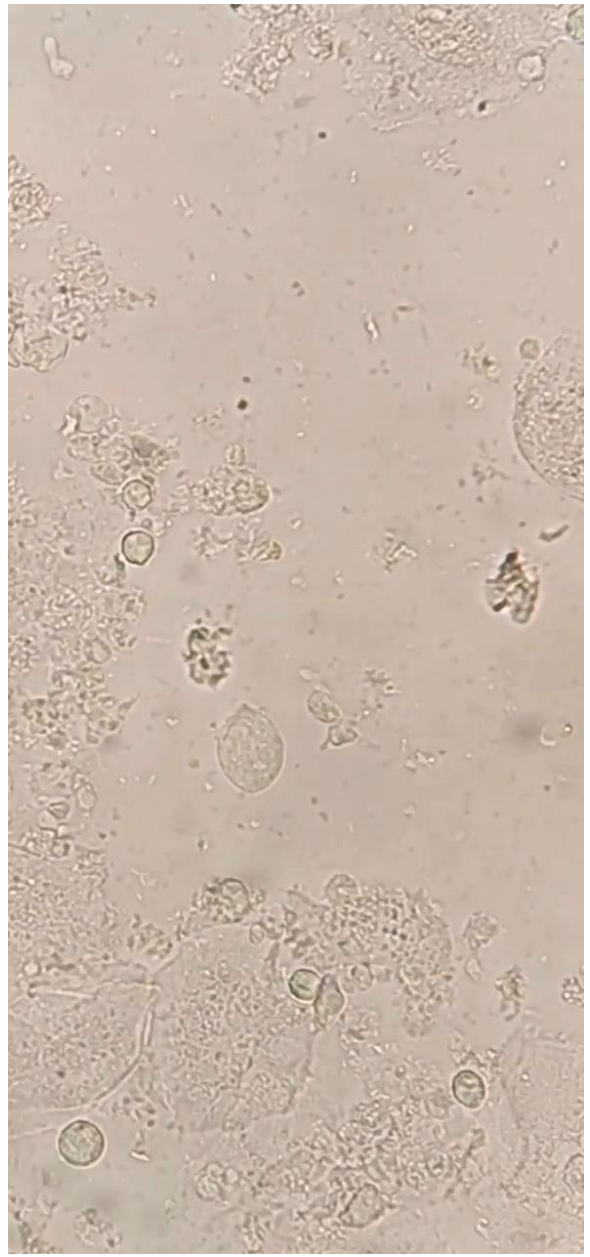
- Nucleic acid amplification test (NAAT) is the preferred method (gold standard) of diagnosis in both men and women due its high sensitivity and specificity.
  - Swab of vaginal fluid or first-void urine testing can detect the DNA or RNA of *T vaginalis*.
- In women, the diagnosis can also be made via wet mount microscopy, which reveals motile, ovoid, flagellated organisms (image).
  - However, the sensitivity is lower (~50%-70%), so patients with a negative wet mount microscopy still require NAAT.



- *T vaginalis* appears as motile, flagellated trophozoites;
- A wet mount of trichomoniasis would show pear-shaped organisms (flagellated trophozoites).



Video - *T vaginalis*



Management

- Treatment for trichomoniasis is required for the patient and all sexual partners, regardless of whether symptoms are present. Treatment options include:
  - **Women**
    - Metronidazole: 500 mg orally twice daily for 7 days OR
    - Tinidazole: 2 g orally in a single dose
  - **Men**
    - Metronidazole: 2 g orally in a single dose OR
    - Tinidazole: 2 g orally in a single dose

Differential diagnosis of vaginitis

Bacterial vaginosis (*Gardnerella vaginalis*)	Trichomoniasis (*Trichomonas vaginalis*)	Candida vaginitis (*Candida albicans*)
		
• Thin, off-white discharge with fishy odor • No inflammation	• Thin, yellow-green, malodorous, frothy discharge • Vaginal inflammation	• Thick, cottage cheese discharge • Vaginal inflammation
		
• pH >4.5 • Clue cells • Positive whiff test (amine odor with KOH)	• pH >4.5 • Motile trichomonads	• Normal pH (3.8-4.5) • Pseudohyphae
Metronidazole or clindamycin	Metronidazole; treat sexual partner	Fluconazole

KOH = potassium hydroxide.

Thank You