

---

# Vaginitis

- Bacterial Vaginosis (BV)
- Vulvovaginal Candidiasis (VVC)
- Trichomoniasis

# Vaginal Environment

- The vagina is a dynamic ecosystem that contains approximately  $10^9$  bacterial colony-forming units.
- Normal vaginal discharge is clear to white, odorless, and of high viscosity.
- Normal bacterial flora is dominated by lactobacilli – other potential pathogens present.
- Lactic acid helps to maintain a normal vaginal pH of 3.8 to 4.2.
- Acidic environment and other host immune factors inhibits the overgrowth of bacteria.
- Some lactobacilli also produce  $H_2O_2$ , a potent microbicide.

# Vaginitis

- Usually characterized by
  - Vaginal discharge
  - Vulvar itching
  - Irritation
  - Odor
- Common types
  - Bacterial vaginosis (40%–45%)
  - Vulvovaginal candidiasis (20%–25%)
  - Trichomoniasis (15%–20%)

# Other Causes of Vaginitis

- Normal physiologic variation
- Allergic reactions
- Herpes simplex virus
- Mucopurulent cervicitis
- Atrophic vaginitis
- Vulvar vestibulitis
- Foreign bodies
- Desquamative inflammatory vaginitis

# Diagnosis of Vaginitis

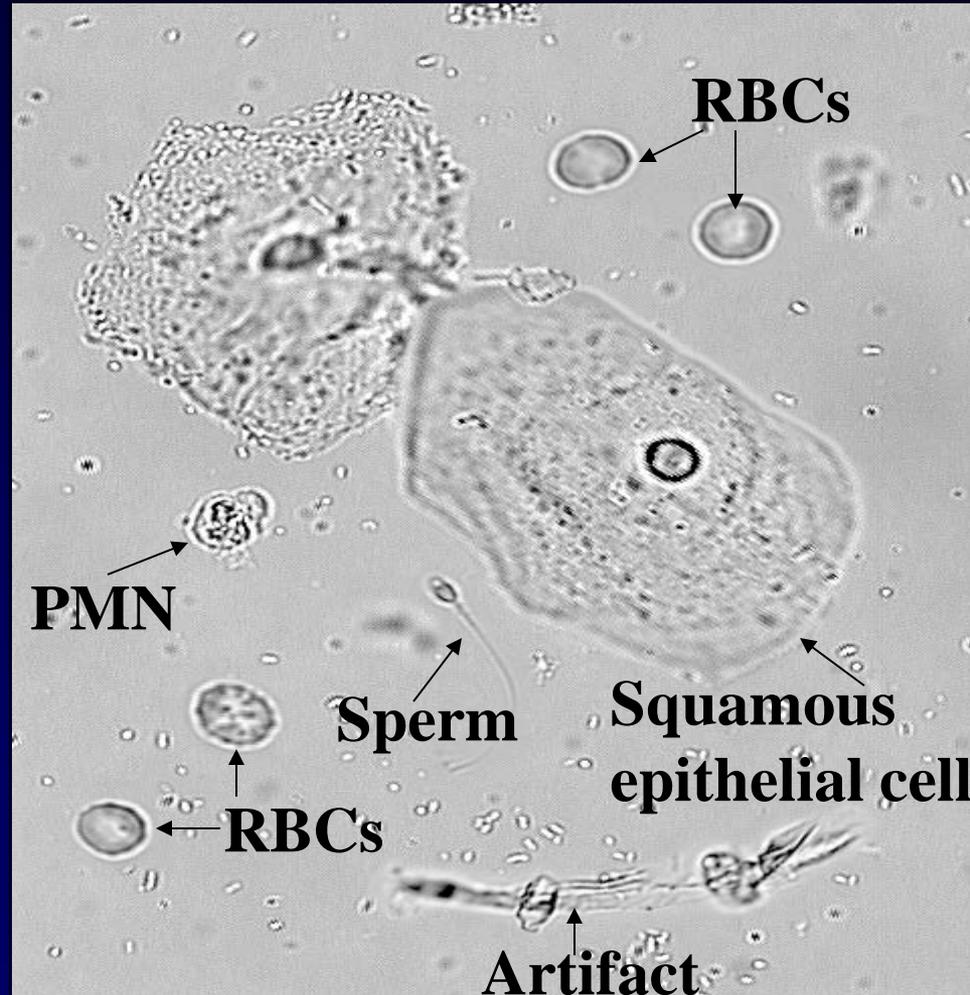
- Patient history
- Visual inspection of internal/external genitalia
- Appearance of discharge

# Preparation and Evaluation of Specimen

- Collection of specimen
- Preparation of specimen slide
- Examination of specimen slide
  - NaCl (wet mount)
  - KOH (wet mount)
- Whiff test
- Vaginal pH

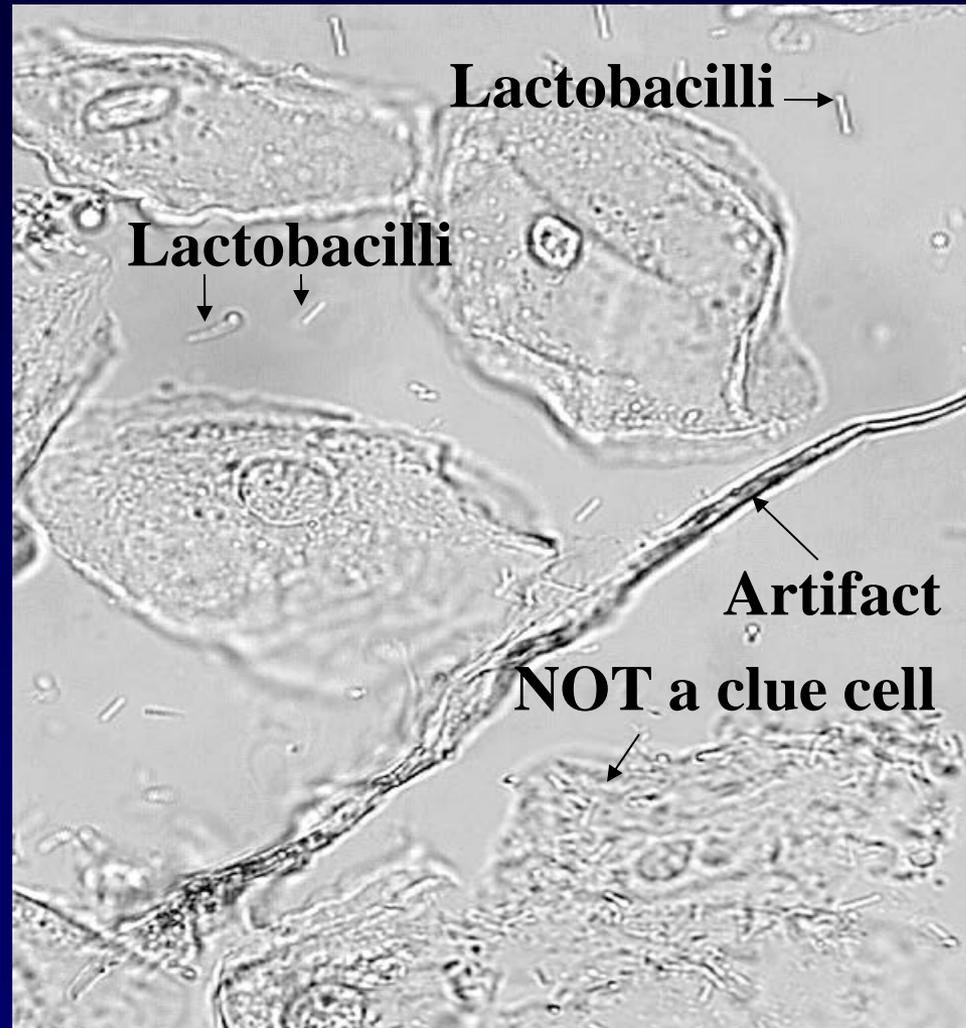
# Wet Prep: Common Characteristics

Saline: 40X objective



# Wet Prep: Lactobacilli and Epithelial Cells

Saline: 40X objective



# Other Diagnostic Aids for Vaginitis Evaluation

- Culture
- DNA probe
- Rapid test
- Nucleic acid amplification tests (NAAT)
- Other tests
  - PIP activity
  - BVBlue
  - PCR assay

# Vaginitis Differentiation

	Normal	Bacterial Vaginosis	Candidiasis	Trichomoniasis
<b>Symptom presentation</b>		Odor, discharge, itch	Itch, discomfort, dysuria, thick discharge	Itch, discharge, ~70% asymptomatic
<b>Vaginal discharge</b>	Clear to white	Homogenous, adherent, thin, milky white; malodorous "foul fishy"	Thick, clumpy, white "cottage cheese"	Frothy, gray or yellow-green; malodorous
<b>Clinical findings</b>			Inflammation and erythema	Cervical petechiae "strawberry cervix"
<b>Vaginal pH</b>	3.8 - 4.2	> 4.5	Usually $\leq$ 4.5	> 4.5
<b>KOH "whiff" test</b>	Negative	Positive	Negative	Often positive
<b>NaCl wet mount</b>	Lacto-bacilli	Clue cells ( $\geq$ 20%), no/few WBCs	Few to many WBCs	Motile flagellated protozoa, many WBCs
<b>KOH wet mount</b>			Pseudohyphae or spores if non- <i>albicans</i> species	10

# Vaginitis

## Bacterial Vaginosis (BV)



# Learning Objectives

Upon completion of this content, the learner will be able to

- Describe the epidemiology of bacterial vaginosis in the U.S.
- Describe the pathogenesis of bacterial vaginosis.
- Describe the clinical manifestations of bacterial vaginosis.
- Identify common methods used in the diagnosis of bacterial vaginosis.
- List CDC-recommended treatment regimens for bacterial vaginosis.
- Describe patient follow up and partner management for patients with bacterial vaginosis.
- Summarize appropriate prevention counseling messages for patients with bacterial vaginosis.

# Lessons

- I. Epidemiology: Disease in the U.S.
- II. Pathogenesis
- III. Clinical manifestations
- IV. Diagnosis
- V. Patient management
- VI. Prevention

# Lesson I: Epidemiology: Disease in the U.S.

# Epidemiology

- Most common cause of vaginitis
- Prevalence varies by population
  - 5%–25% among college students
  - 12%–61% among STD patients
- Widely distributed

# Epidemiology (continued)

- BV linked to
  - Premature rupture of membranes
  - Premature delivery and low birth-weight delivery
  - Acquisition of HIV, *N. gonorrhoeae*, *C. trachomatis*, and HSV- 2
  - Development of PID
  - Post-operative infections after gynecological procedures
  - Recurrence of BV

# Risk Factors

- African American
- Two or more sex partners in previous six months/new sex partner
- Douching
- Lack of barrier protection
- Absence of or decrease in lactobacilli
- Lack of H<sub>2</sub>O<sub>2</sub>-producing lactobacilli

# Transmission

- Currently not considered a sexually transmitted disease, but acquisition appears to be related to sexual activity.

# Lesson II: Pathogenesis

# Microbiology

- Overgrowth of bacteria species normally present in vagina with anaerobic bacteria
- BV correlates with a decrease or loss of protective lactobacilli
  - Vaginal acid pH normally maintained by lactobacilli through metabolism of glycogen.
  - Hydrogen peroxide ( $H_2O_2$ ) is produced by some *Lactobacilli*,sp.
  - $H_2O_2$  helps maintain a low pH, which inhibits bacteria overgrowth.
  - Loss of protective lactobacilli may lead to BV.

# H<sub>2</sub>O<sub>2</sub> -Producing Lactobacilli

- All lactobacilli produce lactic acid.
- Some species also produce H<sub>2</sub>O<sub>2</sub>.
- H<sub>2</sub>O<sub>2</sub> is a potent natural microbicide.
- Present in 42%–74% of females.
- In vitro, H<sub>2</sub>O<sub>2</sub> is toxic to viruses such as HIV, as well as bacteria.

# Lesson III: Clinical Manifestations

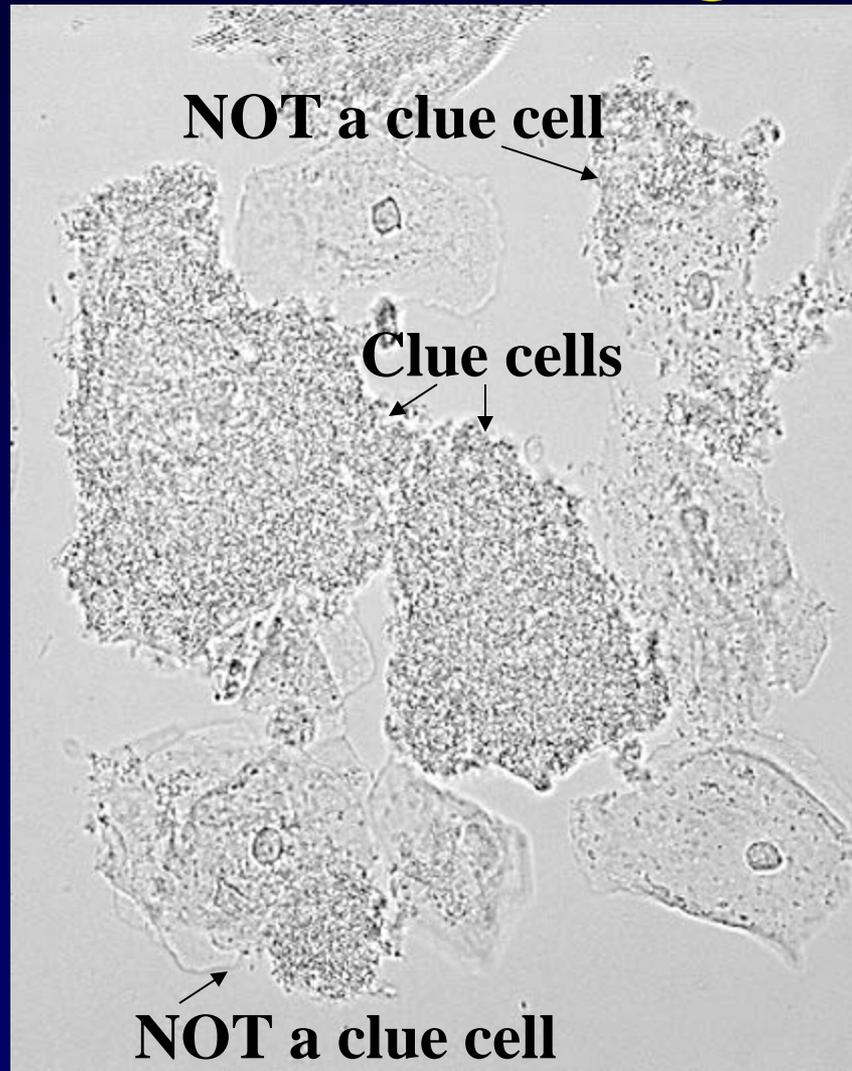
# Clinical Presentation and Symptoms

- Many women (50%–60%) are asymptomatic.
- Signs/symptoms, when present
  - Reported malodorous (fishy smelling) vaginal discharge
  - Reported more commonly after vaginal intercourse and after completion of menses
- Symptoms may remit spontaneously.

# Lesson IV: Diagnosis

# Wet Prep: Bacterial Vaginosis

Saline: 40X objective



# BV Diagnosis: Amsel Criteria

Amsel Criteria:  
Must have at least  
three of the  
following findings:

- Vaginal pH >4.5
- Presence of >20% per HPF of "clue cells" on wet mount examination
- Positive amine or "whiff" test
- Homogeneous, non-viscous, milky-white discharge adherent to the vaginal walls

# Other Diagnostic Tools

- Vaginal Gram stain (Nugent or Speigel criteria)
- Culture
- DNA probe
- Newer diagnostic modalities include
  - PIP activity
  - Sialidase tests

# Lesson V: Patient Management

# Treatment

## CDC-recommended regimens

- Metronidazole 500 mg orally twice a day for 7 days
- or*
- Metronidazole gel 0.75%, one full applicator (5 g) intravaginally, once or twice a day for 5 days
- or*
- Clindamycin cream 2%, one full applicator (5 g) intravaginally at bedtime for 7 days

# Treatment (continued)

## Alternative regimens (nonpregnant)

- Tinidazole 2 g orally once daily for 2 days, **or**
- Tinidazole 1 g orally once daily for 5 days, **or**
- Clindamycin 300 mg orally twice a day for 7 days, **or**
- Clindamycin ovules 100 g intravaginally once at bedtime for 3 days

## Multiple recurrences

- Twice weekly metronidazole gel for 4–6 months may reduce recurrences
- Oral nitroimidazole followed by intravaginal boric acid and suppressive metronidazole gel

# Treatment in Pregnancy

- Pregnant women with symptomatic disease should be treated with one of the following recommended regimens:
  - Metronidazole 500 mg twice a day for 7 days, **or**
  - Metronidazole 250 mg orally 3 times a day for 7 days, **or**
  - Clindamycin 300 mg orally twice a day for 7 days
- Insufficient evidence to assess impact of screening for BV in asymptomatic high-risk women (those who have previously delivered a premature infant)

# Screening and Treatment

- Treatment is recommended for women with symptoms.
- Therapy is not recommended for male or female sex partners of women with BV.
- Treatment of BV in women prior to surgical abortion or hysterectomy may be considered.

# Treatments Not Recommended

- Ampicillin
- Erythromycin
- Iodine
- Dienestrol cream
- Tetracycline/doxycycline
- Triple sulfa
- Ciprofloxacin

# Recurrence

- Recurrence rate is 20% to 40% one month after therapy.
- Recurrence may be a result of persistence of BV-associated organisms and a failure of lactobacillus flora to recolonize.
- Data do not support yogurt therapy or exogenous oral lactobacillus treatment.
- Under study: vaginal suppositories containing human lactobacillus strains.
- Twice weekly metronidazole gel for 4–6 months may reduce recurrences.
- Limited data suggest that oral nitroimidazole followed by intravaginal boric acid and suppressive metronidazole gel might be a treatment option after multiple occurrences.

# Lesson VI: Prevention

# Partner Management

- Relapse or recurrence is not affected by treatment of sex partner(s).
- Routine treatment of sex partners is not recommended.

# Patient Counseling and Education

- Nature of the disease
  - Normal vs. abnormal discharge, malodor, BV signs and symptoms
- Transmission issues
  - Association with sexual activity, high concordance in female same-sex partnerships
- Risk reduction
  - Correct and consistent condom use
  - Avoid douching
  - Limit number of sex partners

# Vaginitis

## Vulvovaginal Candidiasis (VVC)



# Learning Objectives

Upon completion of this content, the learner will be able to:

- Describe the epidemiology of candidiasis in the U.S.
- Describe the pathogenesis of candidiasis.
- Describe the clinical manifestations of candidiasis.
- Identify common methods used in the diagnosis of candidiasis.
- List CDC-recommended treatment regimens for candidiasis.
- Describe patient follow-up and partner management for candidiasis.
- Summarize appropriate prevention counseling messages for patients with candidiasis.

# Lessons

- I. Epidemiology: Disease in the U.S.
- II. Pathogenesis
- III. Clinical manifestations
- IV. Diagnosis
- V. Patient management
- VI. Prevention

# Lesson I: Epidemiology: Disease in the U.S.

# VVC Epidemiology

- Affects most females during lifetime, with approximately 50% having two or more episodes
- Most cases caused by *C. albicans* (85%–90%)
- Second most common cause of vaginitis
- Estimated cost: \$1 billion annually in the U.S.

# Transmission

- Candida species are normal flora of skin and vagina and are not considered to be sexually transmitted pathogens.

# Lesson II: Pathogenesis

# Microbiology

- Candida species are normal flora of the skin and vagina.
- VVC is caused by overgrowth of *C. albicans* and other non-albicans species.
- Yeast grows as oval budding yeast cells or as a chain of cells (pseudohyphae).
- Symptomatic clinical infection occurs with excessive growth of yeast.
- Disruption of normal vaginal ecology or host immunity can predispose to vaginal yeast infections.

# Lesson III: Clinical Manifestations

# Clinical Presentation and Symptoms

- Vulvar pruritis is most common symptom.
- Thick, white, curdy vaginal discharge ("cottage cheese-like")
- Erythema, irritation, occasional erythematous "satellite" lesion
- External dysuria and dyspareunia

# Vulvovaginal Candidiasis



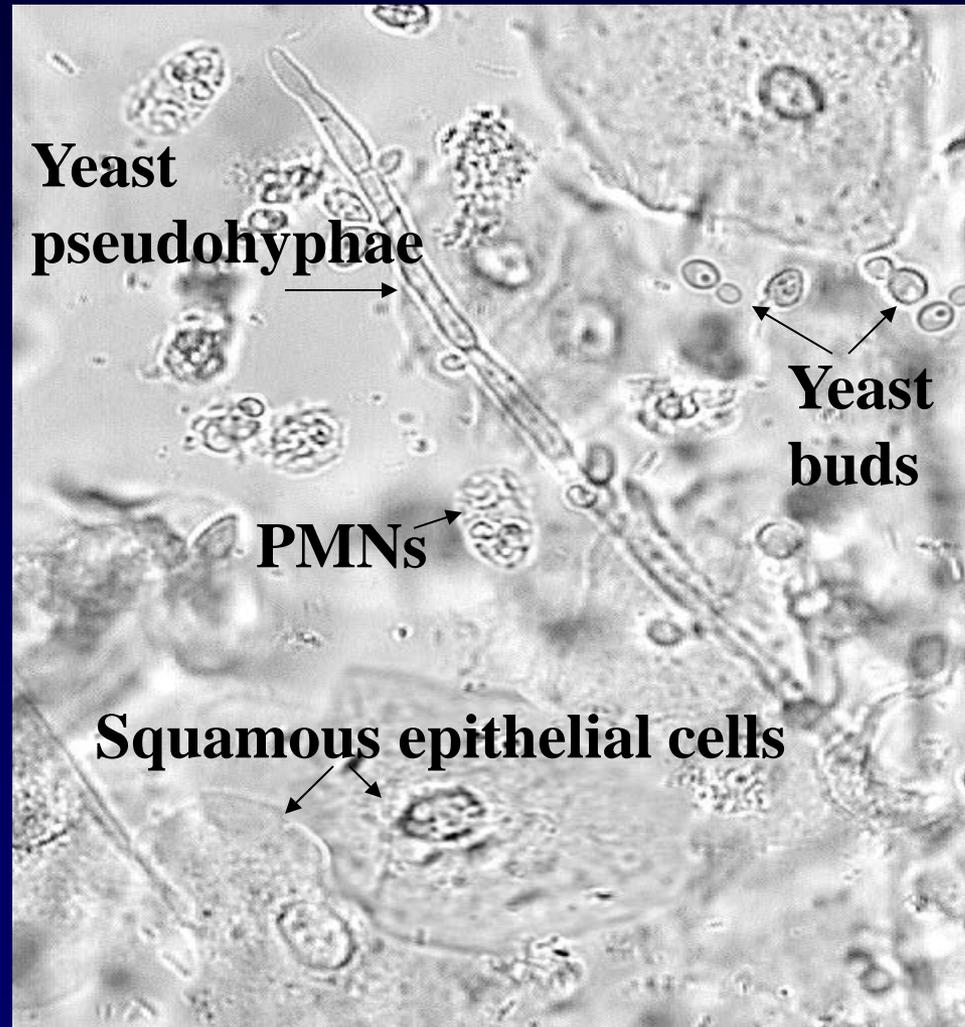
# Lesson IV: Candidiasis Diagnosis

# Diagnosis

- History, signs and symptoms
- Visualization of pseudohyphae (mycelia) and/or budding yeast (conidia) on KOH or saline wet prep
- pH normal (4.0 to 4.5)
  - If pH > 4.5, consider concurrent BV or trichomoniasis infection
- Cultures not useful for routine diagnosis

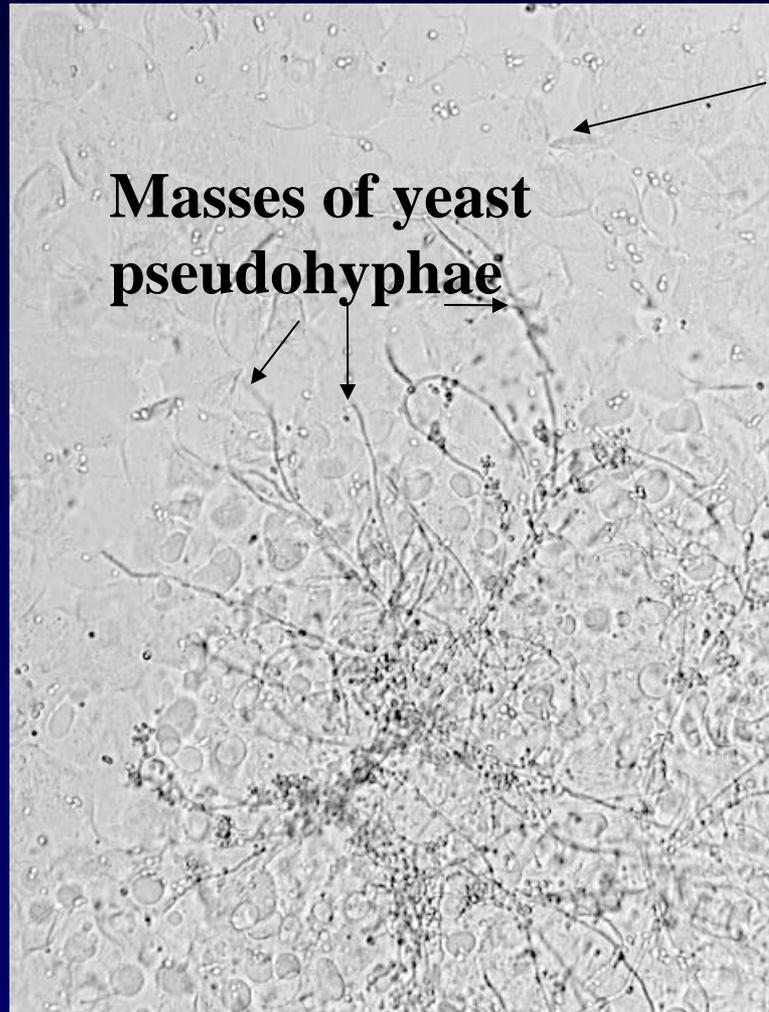
# PMNs and Yeast Pseudohyphae

Saline: 40X objective



# Yeast Pseudohyphae

10% KOH: 10X objective

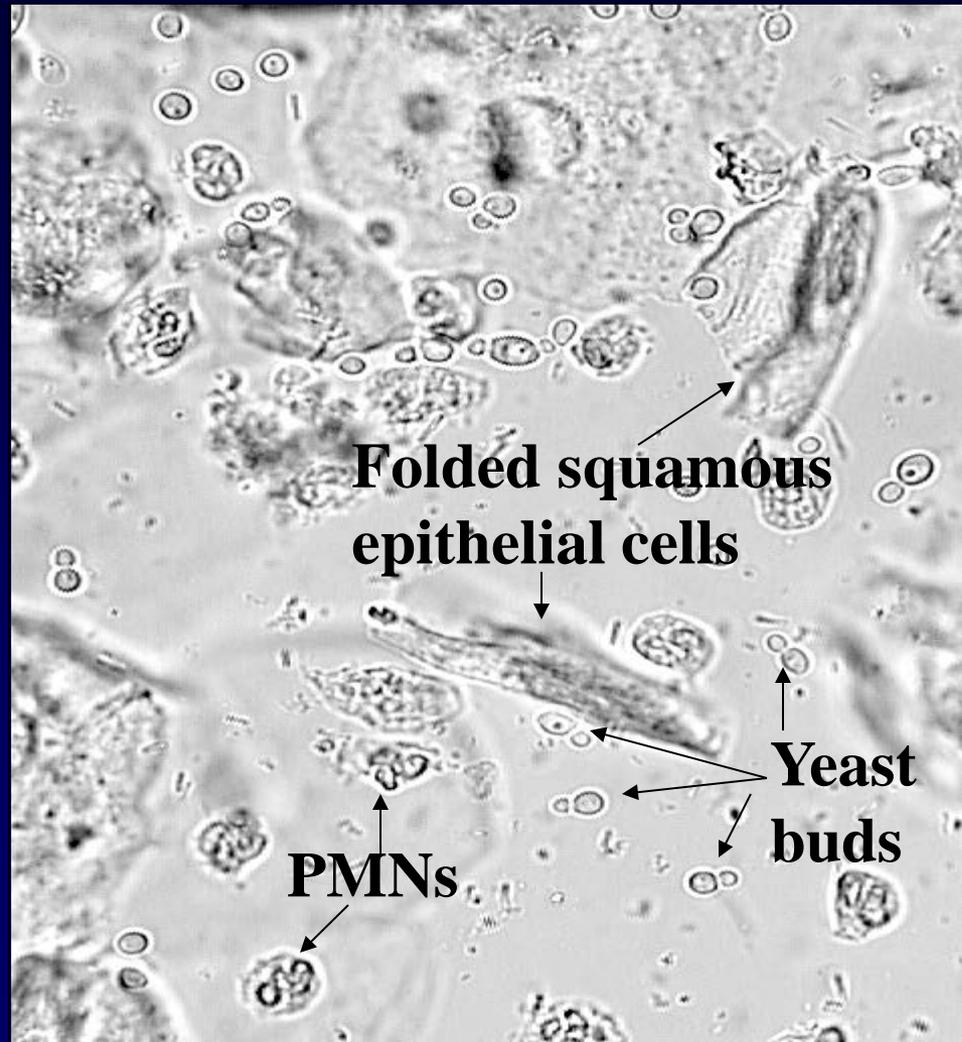


**Masses of yeast  
pseudohyphae**

**Lysed  
squamous  
epithelial cell**

# PMNs and Yeast Buds

Saline: 40X objective



# Lesson V: Patient Management

# Classification of VVC

## Uncomplicated VVC

- Sporadic or infrequent vulvovaginal candidiasis  
or
- Mild-to-moderate vulvovaginal candidiasis  
or
- Likely to be *C. albicans*  
or
- Vulvovaginal candidiasis in nonimmunocompromised women

## Complicated VVC

- Recurrent vulvovaginal candidiasis (RVVC)  
or
- Severe vulvovaginal candidiasis  
or
- Non-albicans candidiasis  
or
- Vulvovaginal candidiasis in women with uncontrolled diabetes, debilitation, or immunosuppression

# Uncomplicated VVC

- Mild to moderate signs and symptoms
- Nonrecurrent
- 75% of women have at least one episode
- Responds to short course regimen

# CDC-Recommended Treatment Regimens for Uncomplicated VVC

## Over-the-Counter Intravaginal Agents

- Butoconazole 2% cream, 5 g intravaginally for 3 days or
- Clotrimazole 1% cream 5 g intravaginally for 7-14 days or
- Clotrimazole 2% cream 5 g intravaginally for 3 days or
- Miconazole 2% cream 5 g intravaginally for 7 days or
- Miconazole 4% cream 5 g intravaginally for 3 days or
- Miconazole 100 mg vaginal suppository, 1 suppository for 7 days or
- Miconazole 200 mg vaginal suppository, 1 suppository for 3 days or
- Miconazole 1,200 mg vaginal suppository, one suppository for 1 day or
- Tioconazole 6.5% ointment 5 g intravaginally in a single application

## Prescription Intravaginal Agents

- **Butoconazole 2% cream, 5 g (single dose bioadhesive product)** intravaginally for 1 day or
- Nystatin 100,000-unit vaginal tablet, 1 tablet for 14 days or
- Terconazole 0.4% cream 5 g intravaginally for 7 days or
- Terconazole 0.8% cream 5 g intravaginally for 3 days or
- Terconazole 80 mg vaginal suppository, 1 suppository for 3 days

## Prescription Oral Agents

- Fluconazole 150 mg oral tablet, 1 tablet in a single dose

Note: The creams and suppositories in these regimens are oil-based and may weaken latex condoms and diaphragms. Refer to condom product labeling for further information.

# Complicated VVC

- Recurrent (RVVC)
  - Four or more episodes in one year
- Severe
  - Edema
  - Excoriation/fissure formation
- Non-albicans candidiasis
- Compromised host

# Complicated VVC Treatment

- Recurrent VVC (RVVC)
  - 7–14 days of topical therapy, or
  - 100 mg, 150 mg , or 200 mg oral dose of fluconazole repeated every 3 days (days 1,4,and 7)
  - Maintenance regimens (see 2010 CDC STD treatment guidelines)
- Severe VVC
  - 7–14 days of topical therapy, or
  - 150 mg oral dose of fluconazole repeated in 72 hours

# Complicated VVC Treatment (continued)

- Non-albicans
  - Optimal treatment unknown
  - 7–14 days non-fluconazole therapy
  - 600 mg boric acid in gelatin capsule vaginally once a day for 14 days for recurrences
- Compromised host
  - 7–14 days of topical therapy
- Pregnancy
  - Fluconazole is contraindicated
  - 7-day topical agents are recommended

# Lesson VI: Prevention

# Partner Management

- VVC is not usually acquired through sexual intercourse.
- Treatment of sex partners is not recommended.
- A minority of male sex partners may have balanitis and may benefit from treatment with topical antifungal agents to relieve symptoms.

# Patient Counseling and Education

- Nature of the disease
  - Normal vs. abnormal vaginal discharge, signs and symptoms of candidiasis, maintain normal vaginal flora
- Transmission Issues
  - Not sexually transmitted
- Risk reduction
  - Avoid douching, avoid unnecessary antibiotic use, complete course of treatment

# Vaginitis

*Trichomonas vaginalis*



# Learning Objectives

Upon completion of this content, the learner will be able to:

- Describe the epidemiology of trichomoniasis in the United States.
- Describe the pathogenesis of *T. vaginalis*.
- Describe the clinical manifestations of trichomoniasis.
- Identify common methods used in the diagnosis of trichomoniasis.
- List CDC-recommended treatment regimens for trichomoniasis.
- Describe patient follow up and partner management for trichomoniasis.
- Describe appropriate prevention counseling messages for patients with trichomoniasis.

# Lessons

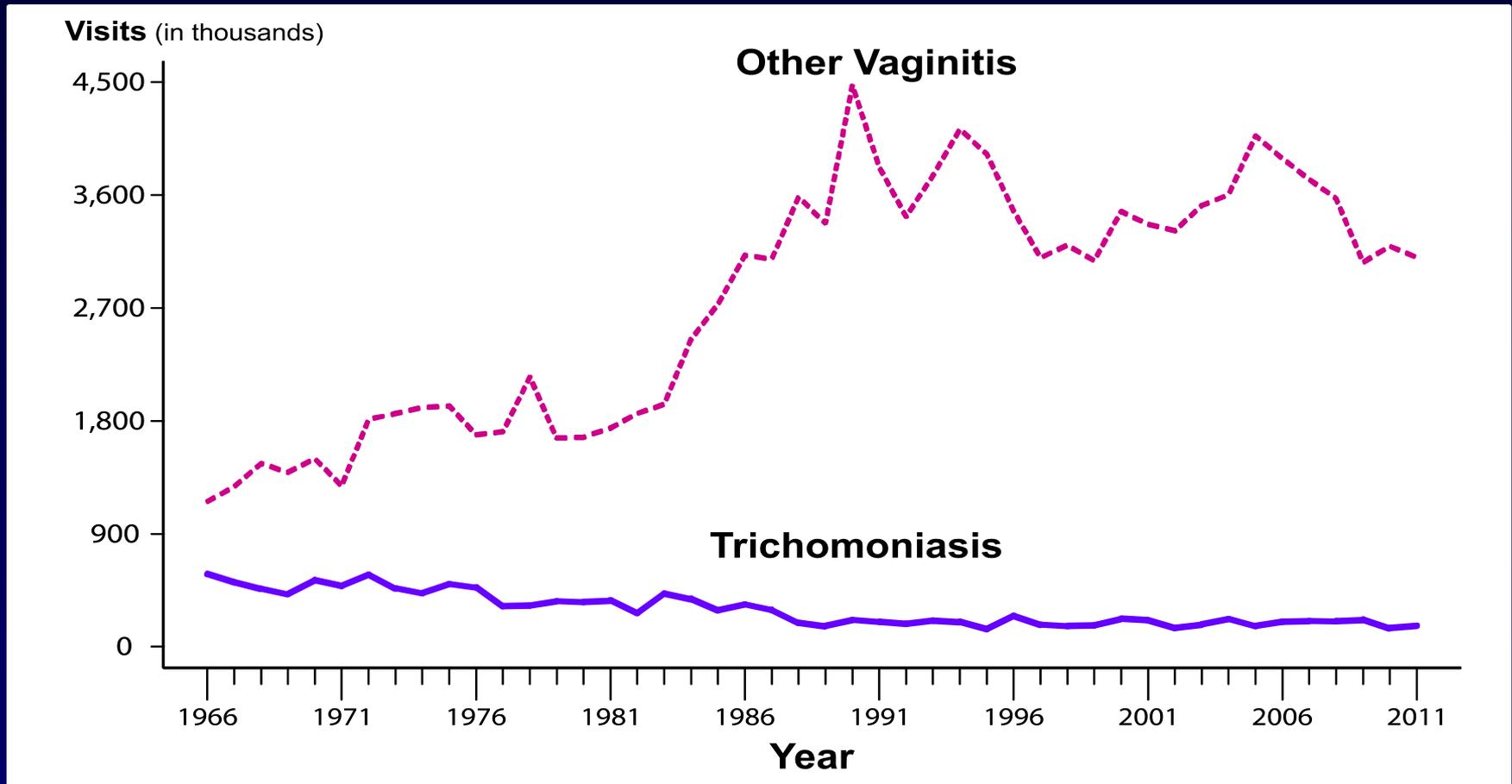
- I. Epidemiology: Disease in the U.S.
- II. Pathogenesis
- III. Clinical manifestations
- IV. Diagnosis
- V. Patient management
- VI. Prevention

# Lesson I: Epidemiology: Disease in the U.S.

# Incidence and Prevalence

- Most prevalent nonviral STI
- Estimated one million cases annually in the U.S. at a medical cost of \$24 million
- Estimated prevalence:
  - 3% in the general female population
  - 1.3% in non-Hispanic white women
  - 1.8% in Mexican American women
  - 13.3% in non-Hispanic black women
  - 40%–60% in female prison inmates and commercial sex workers
  - 18%–50% in females with vaginal complaints

# Trichomoniasis and Other Vaginal Infections— Women—Initial Visits to Physicians' Offices, United States, 1966–2011



NOTE: The relative standard errors for trichomoniasis estimates range from 16% to 27% and for other vaginitis estimates range from 8% to 13%.

SOURCE: IMS Health, Integrated Promotional Services™, IMS Health Report, 1966–2011.

# Risk Factors

- Multiple sexual partners
- Lower socioeconomic status
- History of STDs
- Lack of condom use

# Transmission

- Almost always sexually transmitted.
- Females and males may be asymptomatic.
- Transmission between female sex partners has been documented.

# Lesson II: Pathogenesis

# Microbiology

- Etiologic agent
  - *Trichomonas vaginalis* is a single-celled, flagellated, anaerobic protozoan parasite.
  - Only protozoan that infects the genital tract.
- Associations with
  - Preterm rupture of membranes and pre-term delivery.
  - Increased risk of HIV acquisition and transmission.

# *Trichomonas vaginalis*

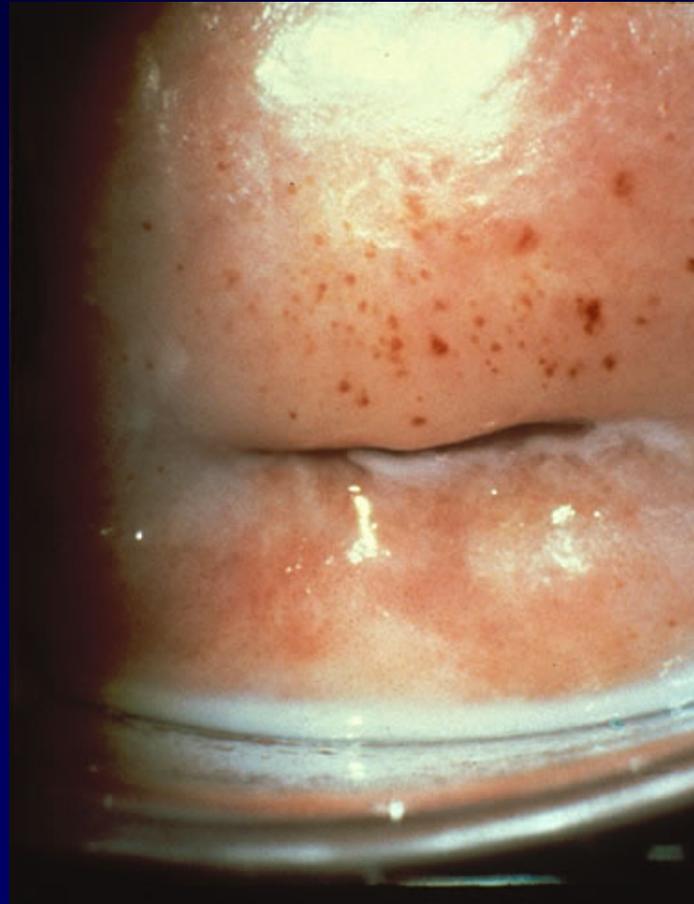


# Lesson III: Clinical Manifestations

# Clinical Presentation and Symptoms in Women

- May be asymptomatic approximately 70% of the time
- Vaginitis
  - Frothy gray or yellow-green vaginal discharge
  - Pruritus
  - Cervical petechiae ("strawberry cervix") - classic presentation, occurs in  $\leq 2\%$  of cases
- May also infect Skene's glands and urethra, where the organisms may not be susceptible to topical therapy
- Trichomoniasis has been associated with increased shedding of HIV in HIV-infected women

# “Strawberry cervix” due to *T. vaginalis*



# Clinical Presentation and Symptoms in Men

- Usually asymptomatic
- May cause 11%–13% of infected males to present with nongonococcal urethritis (NGU)

# Lesson IV: Diagnosis

# Diagnosis in Females

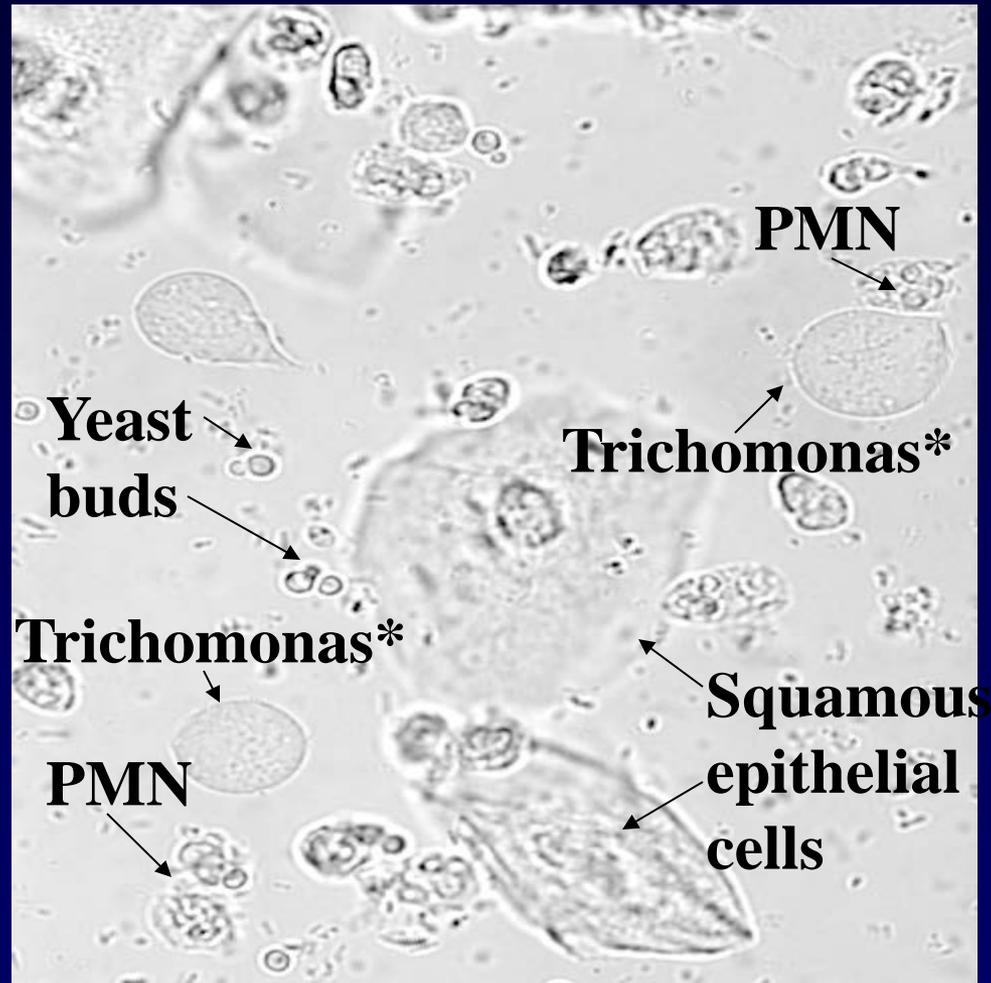
- Motile trichomonads seen on saline wet mount
- Vaginal pH >4.5 often present
- Culture has been the “gold standard”
- Pap smear sensitivity with traditional cytology poor, but enhanced by use of liquid-based testing
- DNA probe
- Rapid test (antigen detection test, OSOM)
- NAAT (urine or vaginal swab)

# Diagnosis in Males

- Culture testing of urethral swab, urine, or semen NAATs
- Sex partners of women diagnosed with *T. vaginalis* should also be treated regardless of initial testing

# Wet Prep: Trichomoniasis

Saline: 40X objective



\*Trichomonas shown for size reference only: must be motile for identification

Source: Seattle STD/HIV Prevention Training Center at the University of Washington

# Lesson V: Patient Management

# Treatment

- CDC-recommended regimen
  - Metronidazole 2 g orally in a single dose or
  - Tinidazole 2 g orally in a single dose
- CDC-recommended alternative regimen
  - Metronidazole 500 mg twice a day for 7 days

# Pregnancy

- CDC-recommended regimen
  - Metronidazole 2 g orally in a single dose
- All symptomatic pregnant women should be treated, regardless of pregnancy stage.

# Treatment Failure

- A common reason for treatment failure is reinfection. Therefore, it is critical to assure treatment of all sex partners at the same time.
- If treatment failure occurs with metronidazole 2 g orally in a single dose for all partners, treat with metronidazole 500 mg orally twice daily for 7 days or tinidazole 2 g orally single dose.
- If treatment failure of either of these regimens, consider retreatment with tinidazole or metronidazole 2 g orally once a day for 5 days.
- If repeated treatment failures occur, contact the Division of STD Prevention, CDC, for metronidazole-susceptibility testing (telephone: 404-718-4141, website: [www.cdc.gov/std](http://www.cdc.gov/std))

# Lesson VI: Prevention

# Partner Management

- Sex partners should be treated.
- Patients should be instructed to avoid sex until they and their sex partners are cured (when therapy has been completed and patient and partner(s) are asymptomatic, about 7 days).

# Patient Counseling and Education

- Nature of the disease
  - May be asymptomatic in both men and women, in women may persist for months to years, untreated trichomoniasis might be associated with adverse pregnancy outcomes, douching may worsen vaginal discharge, alcohol consumption is contraindicated with metronidazole
- Transmission issues
  - Almost always sexually transmitted, fomite transmission rare, might be associated with increased susceptibility to HIV acquisition

# Risk Reduction

The clinician should

- Assess patient's potential for behavior change.
- Discuss individualized risk-reduction plans with the patient.
- Discuss prevention strategies such as abstinence, monogamy, use of condoms, and limiting the number of sex partners.
- Latex condoms, when used consistently and correctly, can reduce the risk of transmission of the *T. vaginalis* parasite.

---

# Case Study



# History

## Tanya Walters

- 24-year-old single female
- Presents with complaints of a smelly, yellow vaginal discharge and slight dysuria for one week
- Denies vulvar itching, pelvic pain, or fever
- Two sex partners during the past year—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

# Questions

1. What is your differential diagnosis based on history and physical examination?
2. Based on the differential diagnosis of vaginitis, what is the etiology?
3. Which laboratory tests should be offered or performed?

# Laboratory Results

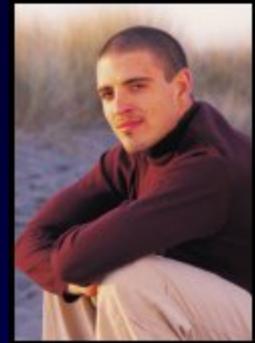
- Vaginal pH - 6.0
- Saline wet mount of vaginal secretions -- numerous motile trichomonads and no clue cells
- KOH wet mount -- negative for budding yeast and pseudohyphae

4. What may one reasonably conclude about Tanya's diagnosis?

5. What is the appropriate CDC-recommended first-line treatment for this patient?



# Partner Management



**Jamie**

**Calvin**

- Last sexual contact: 2 days ago
- First sexual contact: 2 months ago
- Twice a week, vaginal sex

- Last sexual contact: 6 months ago
- First sexual contact: 7 months ago
- 3 times a week, vaginal and oral sex

6. How should Jamie and Calvin be managed?

## Follow-Up

- Tanya was prescribed metronidazole 2 g orally, and was instructed to abstain from sexual intercourse until her current partner was treated.
  - She returned two weeks later. She reported taking her medication, but had persistent vaginal discharge that had not subsided with treatment. She reported abstinence since her clinic visit, and her partner had moved out of the area. Her tests for other STDs (including chlamydia and gonorrhea) were negative.
  - The vaginal wet mount again revealed motile trichomonads.
7. What is the appropriate therapy for Tanya now?
  8. What are appropriate prevention and counseling messages for Tanya?