Ready-to-Use

STD Curriculum for Clinical Educators

Vaginitis Module

Target Audience - Faculty in clinical education programs, including those programs that train advanced practice nurses, physician assistants, and physicians

Contents - The following resources are provided in this module:

- **Faculty Notes** (Microsoft Word and Adobe Acrobat formats) - Includes notes that correspond to the slide presentation, a case study with discussion points, and test questions with answers
- **Slide Presentation** (Microsoft PowerPoint and Adobe Acrobat formats)
- **Student Handouts**
  - **Case Study** (Microsoft Word format)
  - **Test Questions** (Microsoft Word format)
  - **Slides Handout** (Adobe Acrobat format)
  - **Resources** (Microsoft Word format)

Suggested Time Allowance - The approximate time needed to present this module is 60-90 minutes.

These materials were developed by the Program and Training Branch, Division of STD Prevention, CDC. They are Based on the curriculum developed by the National Network of STD/HIV Prevention Training Centers (NNPTC) which includes recommendations from the 2006 CDC STD Treatment Guidelines

Information on the NNPTC can be accessed at:

http://depts.washington.edu/nnptc/index.html

The 2006 CDC STD Treatment Guidelines can be accessed or ordered online at:

http://www.cdc.gov/std/treatment/

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Vaginitis

Bacterial Vaginosis (BV)
Vulvovaginal Candidiasis (VVC)
Trichomoniasis

This module provides an overview of normal vaginal flora, common causes of vaginitis, and general information on the diagnosis and evaluation of vaginitis. The module covers bacterial vaginosis, candidiasis, and trichomoniasis in detail.

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I. Vaginal Environment

A. The vagina is a dynamic ecosystem that normally contains approximately 10^9 bacterial colony-forming units per gram of vaginal fluid.
B. The normal vaginal discharge is clear to white, odorless, and of high viscosity.
C. The normal bacterial flora is dominated by lactobacilli, but a variety of other organisms, including some potential pathogens, are also present at lower levels.
D. Lactobacilli convert glycogen to lactic acid.
E. Lactic acid helps to maintain a normal acidic vaginal pH of 3.8 to 4.2.
F. The acidic environment and other host immune factors inhibit the overgrowth of bacteria and other organisms with pathogenic potential.
G. Some lactobacilli also produce hydrogen peroxide (H_2O_2), a potent microbicide that kills bacteria and viruses.

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II. Vaginitis

A. Vaginitis can be characterized by any of the following: vaginal discharge, vulvar itching, vulvar irritation, vaginal odor, dyspareunia, and dysuria.
B. The three most common types of vaginitis are: bacterial vaginosis (40%-45%), and vulvovaginal candidiasis (20%-25%), trichomoniasis (15%-20%). In some cases the etiology may be mixed, and there may be more than one disease present.

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C. Other causes of vaginal discharge or irritation may include:
    1. Normal physiologic variation
    2. Allergic reactions, e.g., spermicides, deodorants
    3. Herpes Simplex Virus (HSV)
    4. Mucopurulent cervicitis--may be related to *Chlamydia trachomatis* or *Neisseria gonorrhoeae* infection
    5. Atrophic vaginitis--found in lactating and post-menopausal women and related to a lack of estrogen
    6. Vulvar vestibulitis, lichen simplex chronicus, and lichen sclerosis (especially pruritis)
    7. Foreign bodies, e.g., retained tampons
    8. Desquamative inflammatory vaginitis

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III. Diagnosis and Evaluation

A. Diagnosis of vaginitis
   1. Patient history
   2. Visual inspection of the external genitalia, vagina, and cervix
   3. Appearance of vaginal discharge: color, viscosity, adherence to vaginal walls, odor

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B. Preparation and Evaluation of Specimen
   1. Collection of specimen: collect discharge from the lateral wall of the vagina with a swab;
   2. Prepare specimen slide (wet mount)
      a) With a drop of .9% warm saline and a drop of discharge; place cover slip on slide and examine microscopically at low and high power for clue cells and motile trichomonads.
      b) Alternately: Place swab with discharge in 0.5 mL .9% warm saline; touch the swab to a slide and place cover slip on slide and examine microscopically at low and high power.
   3. In addition to wet mount, the following diagnostic steps can be helpful in the diagnosis of vaginitis:
      a) KOH (wet mount): microscopic examination of discharge for hypae with 10% KOH
      b) Whiff test: assessment of a fishy odor after application of 10% KOH to wet mount
      c) Vaginal pH: determine vaginal pH with narrow-range pH paper

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C. Image: Wet Prep: Common characteristics
   1. Note squamous epithelial cell, polymorphonuclear (PMN) leukocyte, red blood cells (RBCs).

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D. Image : Wet Prep: Lactobacilli and epithelial cells
   1. Note lactobacilli and squamous epithelial cells.

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E. Other available diagnostics for vaginitis evaluation
   1. Culture: Available for both *T. vaginalis* and *Candida spp*. Culture may be useful in the management of persistent or recurrent vulvovaginal candidiasis. Culture for *T. vaginalis* is more sensitive than wet mount but not widely available. Culture for bacterial vaginosis is not recommended
   2. DNA probe - (BD, Affirm VP III) for *Trichomonas vaginalis*, *Candida albicans*, and *Gardnerella vaginalis* is available. Sensitivity, specificity, and clinical utility are higher than wet mount but lower than culture.

3. Rapid antigen test-(OSOM TV, Genzyme Diagonostics, Inc) for *T. vaginalis* is an available point of care test. Sensitivity higher than wet mount but similar to culture.
4. Other commercially available diagnostic tests for BV:
   a) PIP activity (Proline aminopeptidase)
   b) BV-blue® (Genzyme Diagnostics, Inc) detects sialidase produced by *G. vaginalis* and other species

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F. Vaginitis differentiation table: useful criteria for diagnosing vaginitis

Vaginitis: Differentiating BV, Candidiasis, and Trichomoniasis

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

			non-*albicans* species	

Vaginitis
Bacterial Vaginosis (BV)

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Learning Objectives

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

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

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Lessons

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

[Slide 14]

I. Epidemiology: Disease in the U.S.

[Slide 15]

A. Most common cause of vaginitis. Occurrence of BV may be associated with a variety of sexual behaviors, but BV is not considered an STD.
B. Widely distributed. National data show that the prevalence is 29% but varies by population: 5%-25% in college students, 12%-61% in STD patients.

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C. BV linked to premature rupture of membranes, premature delivery, and low birth-weight delivery, acquisition of HIV, and development of PID and post-operation infections after gynecological procedures.

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D. More common in African-American women, women who douche, women with a new sex partner, women with more than two sex partners in previous six months, lack of barrier protection and women who lack peroxide (H_2O_2)-producing lactobacilli in their vaginal flora. High concordance identified in female same-sex partnerships.

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E. Acquisition: currently not considered a sexually transmitted disease, but it appears to be related to sexual activity.

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II. Pathogenesis

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A. Overgrowth of bacteria species normally present in vagina, but at low levels, such as *Haemophilus*, *Gardnerella*, *Bacteroides*, *Mycoplasma hominis*, *Mobiluncus*, *Peptostreptococcus, Ureaplasma*
B. BV correlates with the decrease or absence of protective lactobacilli.
    1. Lactobacilli produce lactic acid through metabolism of glucose/glycogen.
    2. Lactic acid keeps the vaginal pH acidic which inhibits growth of other bacterial species.
    3. When lactobacilli are lacking, overgrowth of bacterial occurs.
    4. Hydrogen peroxide-producing *Lactobacillus* spp. helps to maintain a low pH, which may directly inhibit some organisms.
    5. Loss of protective lactobacilli may lead to BV.

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C. Hydrogen peroxide-producing lactobacillus
    1. All lactobacilli produce lactic acid.
    2. Some species also produce hydrogen peroxide.
    3. Hydrogen peroxide is a potent natural microbicide.
    4. Present in 42%-74% of females. The prevalence of BV in women who have H_2O_2 species is 4%.
    5. In vitro, H_2O_2 is toxic to viruses such as HIV as well as to bacteria.

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III. Clinical Manifestations

[Slide 23]

A. Most women (84%) are asymptomatic.
B. If symptomatic, most women will report malodorous (fishy smelling) vaginal discharge which occurs most commonly after vaginal intercourse and after completion of menses. Vaginal pruritis may also be present.
C. Symptoms may remit spontaneously.

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IV. Diagnosis

[Slide 25]

A. Image: Bacterial vaginosis wet prep

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B. Bacterial vaginosis can be diagnosed using the following Amsel criteria. The presence of 3 of the 4 criteria is diagnostic:
    1. Vaginal pH >4.5 (most sensitive but least specific)
    2. Presence of "clue cells" on wet mount examination (bacterial clumping upon the borders of epithelial cells). Clue cells should constitute at least 20% of all epithelial cells (an occasional clue cell does not fulfill this criterion).
    3. Positive amine or "whiff" test (liberation of biologic amines with or without the addition of 10% KOH)
    4. Homogeneous, non-viscous, milky-white discharge adherent to the vaginal walls

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C. Gold standard for diagnosis of BV is vaginal Gram stain (Nugent or Speigel criteria). A normal Gram stain would show lactobacillus (long Gram- positive rods) only or lactobacillus with Gardnerella. When a more mixed flora is present (Gram-positive cocci, small Gram-negative rods, curved Gram-variable rods) and lactobacillus absent or present in low numbers, the smear would be interpreted as consistent with BV.
D. Culture is not recommended.
E. DNA probe--Affirm™ V.P. III, can detect high levels of *G. vaginalis*.
F. Other diagnostic modalities include PIP activity and sialidase tests (BVBlue). These tests detect abnormal pH, high levels of trimethylamine or high levels of proline aminopeptidase.

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V. Patient Management

[Slide 29]

A. Treatment
    1. CDC-recommended regimens (non-pregnant patients)
        a) Metronidazole 500 mg orally twice a day for 7 days
        b) Metronidazole gel 0.75% 1 applicator-full once or twice daily for 5 days. If once daily, administer at bedtime.
        c) Clindamycin cream 2% 1 applicator-full intravaginally at bedtime for 7 days
    2. Alternative regimens (non-pregnant patients)
        a) Clindamycin 300 mg orally twice a day for 7 days
        b) Clindamycin ovules 100 mg intravaginally at bedtime for 3 days
    3. Multiple recurrences
        a) Twice weekly metronidazole gel for 6 months may reduce recurrences

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B. Treatment in pregnancy
    1. All pregnant women with symptomatic disease should be treated. Recommended regimen:
        a) Metronidazole 500 mg twice a day for 7 days, or
        b) Metronidazole 250 three times a day for 7 days, or
        c) Clindamycin 300 mg orally 2 times a day for 7 days.
        d) Some experts suggest that treating early in pregnancy may actually be important in preventing adverse outcome.
    2. Some experts recommend screening and treatment of BV in asymptomatic pregnant women at high-risk (those who have previously delivered a premature infant):
        a) At first prenatal visit; and
        b) A follow up evaluation 1 month after completion of therapy

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C. Screening and treatment in asymptomatic patients: Most professional groups do not recommend screening asymptomatic patients.
    1. Therapy may not be necessary for asymptomatic women with BV.
    2. Therapy is not recommended for male partners of women with BV.
    3. Female partners of women with BV should be examined and treated if BV is present.
    4. Screen and treat women with BV prior to surgical abortion or hysterectomy. BV has been associated with endometritis, PID, or vaginal cuff cellulitis in women undergoing ambulatory invasive procedures. (endometrial biopsy, hysteroscopy, IUD insertions) and women scheduled for vaginal or abdominal surgery.
    5. Asymptomatic patients with BV who are to undergo surgical abortion or hysterectomy should be treated. However, data are insufficient to recommend treatment of asymptomatic patients prior to procedures other than surgical abortion or hysterectomy.
D. Drugs **not** recommended for the treatment of BV include ampicillin, erythromycin, iodine, dienestrol cream, tetracycline/doxycycline, triple sulfa, and ciprofloxacin.

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E. Recurrence
    1. The recurrence rate is 20% to 40% after one month
    2. Recurrence may be a result of persistence of BV-associated organisms and failure of lactobacillus flora to recolonize.
    3. Data do not support yogurt therapy or exogenous oral lactobacillus treatment.
    4. Under study: vaginal suppositories containing human lactobacillus strains
    5. Twice weekly metronidazole gel for 6 months may reduce recurrences

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VI. Prevention

[Slide 34]

A. Partner management
    1. After multiple occurrences, some consider empiric treatment of male sex partners to see if recurrence rate diminishes. This approach has not been validated.
    2. Repeat suppressive therapy

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B. Patient counseling and education—should cover the nature of the disease, transmission issues, and risk reduction.
    a) Nature of the disease
        1) Normal vs. abnormal discharge
        2) Malodor symptomatology
        3) Other signs and symptoms of BV

    b) Transmission issues
        1) High concordence in female same sex partnerships
        2) Association with sexual activity
    c) Risk reduction
        1) Consistent and correct condom use
        2) Avoid douching
        3) Limit number of sex partners

Vaginitis
Vulvovaginal Candidiasis (VVC)

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Learning Objectives

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

1. Describe the epidemiology of candidiasis in the U.S.
2. Describe the pathogenesis of *C. albicans.*
3. Describe the clinical manifestations of candidiasis.
4. Identify common methods used in the diagnosis of candidiasis.
5. List CDC-recommended treatment regimens for candidiasis.
6. Describe patient follow up and partner management for candidiasis.
7. Summarize appropriate prevention counseling messages for patients with candidiasis.

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Lessons

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

[Slide 39]

I. Epidemiology: Disease in the U.S.

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A. Commonly called “yeast infection.” Affects most females at least once during lifetime. Second most common cause of vaginitis after bacterial vaginosis.
B. Most cases of candidiasis are caused by *C. albicans* (85%-90%). *C. glabrata* and *C. parapsilosis* are responsible for 5%-10% of cases.
C. Diagnosis and therapy costs estimated at $1 billion per year.
D. Frequent infections may be linked to diabetes, corticosteroids, repeated courses of antibiotics, pregnancy, or HIV disease, although most patients have no risk factors.

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

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II. Pathogenesis

[Slide 43]

A. Microbiology

1. Candida species are normal flora of skin and vagina. Candida species may be isolated from 20% of asymptomatic healthy women.
2. VVC is caused by overgrowth of *Candida albicans* or non-albicans species.
3. Yeast grows as oval budding yeast cells and as chains of cells (pseudohyphae).
4. Symptomatic clinical infection occurs in the setting of excessive growth of yeast, which is usually kept in check by normal vaginal bacteria.
5. Disruption of normal vaginal ecology or host immunity can predispose to vaginal yeast infections (e.g., pregnancy, diabetes, HIV infection, or, in some women, antibiotic use).

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III. Clinical Manifestations

[Slide 45]

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

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E. Image: Vulvovaginal Candidiasis

[Slide 47]

IV. Diagnosis

[Slide 48]

A. History, clinical presentation, and symptoms
B. Visualization of pseudohyphae (mycelia) and/or budding yeast (conidia) on 10% KOH wet prep examination (preferred), saline wet mount, or Gram stain
C. pH normal (4.0 to 4.5). If pH is abnormally high ($\geq$ 4.5), consider concurrent bacterial vaginosis (BV) or trichomoniasis.
D. Cultures not useful for routine diagnosis, since positive cultures may be detecting colonization rather than clinically significant infections. Cultures may be useful to detect non-albicans species or resistant organisms in women with recurrent disease.
E. DNA probe is available but expensive.

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F. Image: PMNs and yeast buds

[Slide 50]

G. Image: PMNs and yeast pseudohyphae

[Slide 51]

H. Image: Yeast pseudohyphae

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V. Patient Management

[Slide 53]

A. Classification of VVC–uncomplicated or complicated
   1. Uncomplicated VVC includes:
      a) Sporadic or infrequent vulvovaginal candidiasis, mild-to-moderate vulvovaginal candidiasis, or vulvovaginal candidiasis in non-immunocompromised women
   2. Complicated VVC includes:
      a) Recurrent vulvovaginal candidiasis (RVVC), severe vulvovaginal candidiasis, non-albicans candidiasis, or vulvovaginal candidiasis in women with uncontrolled diabetes, debilitation, immunosuppression, or in those who are pregnant.

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B. Uncomplicated VVC
   1. Mild to moderate signs and symptoms, sporadic, non-recurrent disease in a normal host with normally susceptible *C. albicans.*
   2. 75% of women have at least one lifetime episode.
   3. Responds to all azole treatment regimens including short (3-day) and single-dose oral and vaginal therapy.

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C. CDC-recommended regimens for uncomplicated VVC
   1. Intravaginal agents: All intravaginal agents are equivalent. Vaginal regimens are reported by some to yield quick relief of symptoms without gastrointestional side effects.
      a) Butoconazole 2% cream, 5 g intravaginally for 3 days† or butoconazole sustained release single intravaginal application
      b) Clotrimazole 1% cream 5 g intravaginally for 7-14 days†
      c) Clotrimazole 100 mg vaginal tablet for 7 days
      d) Clotrimazole 100 mg vaginal tablet, 2 tablets for 3 days
      e) Miconazole 2% cream 5 g intravaginally for 7 days†
      f) Miconazole 100 mg vaginal suppository, 1 suppository for 7 days†
      g) Miconazole 200 mg vaginal suppository, 1 suppository for 3 days†
      h) Miconazole 1,200 mg vaginal suppository, 1 suppository for 1 day
      i) Nystatin 100,000-U vaginal tablet, 1 tablet for 14 days
      j) Tioconazole 6.5% ointment 5 g intravaginally in a single application†
      k) Terconazole 0.4% cream 5 g intravaginally for 7 days
      l) Terconazole 0.8% cream 5 g intravaginally for 3 days
      m) Terconazole 80 mg vaginal suppository, 1 suppository for 3 days
   2. Oral agent: Fluconazole 150 mg oral tablet, 1 tablet in a single dose

†Over-the-counter (OTC) preparations

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.

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D. Complicated VVC – Approximately 10% to 20% of women will have complicated VVC. VVC is considered complicated when the following exists:
    1. Recurrent VVC (RVVC): four or more episodes in 1 year, consider getting culture to identify species and confirm diagnosis
    2. Severe VVC: extensive vulvar erythema, edema, excoriation or fissure formation, long course recommended
    3. Non-albicans species: requires longer duration of treatment (10-15 days) with topical azoles
    4. Compromised host: women with diabetes, immunosuppression, HIV
    5. Pregnancy

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E. Treatment of complicated VVC
    1. Recurrent VVC (RVVC)
        a) 7-14 days of topical therapy, or 100 mg,150 mg, or 200 mg oral dose of fluconazole every third day for a total of 3 doses (day 1, 4, 7)
        b) While some women with RVVC have risk factors, most women do not. Recurrent disease may be more likely due to non-albicans species.
        c) After an initial intensive regimen of 7-14 days, a maintenance regimen for at least 6 months is recommended.
        d) Maintenance regimens:
            1) Fluconazole 100mg, 150mg or 200mg orally weekly for 6 months
            2) Clotrimazole 200 mg twice a week topically
            3) Clotrimazole 500 mg dose vaginal suppositories once weekly
        e) RVVC should be confirmed by culture before initiating maintenance therapy. VVC diagnosis should also be periodically re-confirmed, and the presence of other contributory causes (new trichomoniasis or BV) assessed.
        f) Patients with RVVC who are receiving treatment should receive regular follow up to monitor the effectiveness of therapy and the occurrence of drug side effects.
        g) Drug interactions with oral treatment may occur
    2. Severe VVC
        a) 7-14 days of topical therapy, or 150 mg oral dose of fluconozole repeated in 72 hours
        b) In cases associated with severe vulvitis and intense pruritis, topical applications of low-potency corticosteroid cream or nystatin cream may be beneficial.

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3. Non-albicans VVC
    a) Optimal treatment unknown
    b) 7-14 days with a non-fluconozole therapy (oral or topical)
    c) 600 mg boric acid in gelatin capsule vaginally once a day for 14 days for recurrences
4. VVC in a compromised host
    a) 7-14 days of topical therapy
5. VVC in pregnancy
    a) Fluconozole is contraindicated.
    b) 7-day topical agents are recommended.

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VI. Prevention

[Slide 60]

A. Partner management
    1. VVC is not usually acquired through sexual intercourse; treatment of sex partners is not recommended but may be considered in women who have recurrent infection.
    2. A minority of male sex partners may have balanitis, characterized by erythematous areas on the glans penis in conjunction with pruritis or irritation. They may benefit from treatment with topical antifungal agents to relieve symptoms.

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B. Patient counseling and education should cover the nature of the disease, transmission issues, and risk reduction.
    1. Nature of the disease
        a) Normal vs. abnormal vaginal discharge
        b) Signs and symptoms of candidiasis
        c) Maintain normal vaginal flora
        d) Control of predisposing conditions
    2. Transmission
        a) Not sexually transmitted
    3. Risk reduction
        a) Avoid douching
        b) Avoid unnecessary antibiotic use
        c) Contact health provider if symptoms persist or recur within 2 months
        d) Complete course of treatment

Vaginitis
Trichomoniasis *(Trichomonas vaginalis*)

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Learning Objectives

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

1. Describe the epidemiology of trichomoniasis in the U.S.
2. Describe the pathogenesis of *Trichomonas vaginalis.*
3. Describe the clinical manifestations of trichomoniasis.
4. Identify common methods used in the diagnosis of trichomoniasis.
5. List CDC-recommended treatment regimens for trichomoniasis.
6. Describe patient follow-up and partner management for patients with trichomoniasis.
7. Describe appropriate prevention counseling messages for patients with trichomoniasis.

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Lessons

I. Epidemiology
II. Pathogenesis
III. Clinical manifestations
IV. Diagnosis
V. Patient management
VI. Prevention

[Slide 65]

I. Epidemiology: Disease in the U.S.

[Slide 66]

A. Incidence and prevalence
   1. Most common treatable STD.
   2. Estimated 3 million cases annually in the U.S. at a medical cost of $375 million.
   3. Approximately 3% prevalence in the general female population.
   4. 1.3% in non-Hispanic white women
   5. 1.8% in Mexican American women
   6. 13.3% in non-Hispanic black women
   7. Prevalence increases with age among non-Hispanic black women
   8. 50%-60% prevalence in female prison inmates and commercial sex workers.
   9. 18%-50% prevalence in females with vaginal complaints.
   10. 85% of women are asymptomatic.
   11. Not routinely tested in men. A 17% prevalence rate was seen in males attending an STD clinic in one city.

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B. Graph: Trichomoniasis and other vaginal infections — Initial visits to physicians'

offices: United States, 1966–2006

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C. Risk factors
    1. Multiple sex partners
    2. Low socioeconomic status
    3. History of STDs
    4. Lack of condom use

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D. Transmission
    1. Almost always sexually transmitted; fomite transmission is rare.
    2. *T. vaginalis* may persist from months to years in epithelial crypts and periglandular areas. Distinguishing persistent, subclinical infection from remote sexual acquisition is not always possible.
    3. Females and males may be asymptomatic.
    4. Transmission between female sex partners has been documented.

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II. Pathogenesis

[Slide 71]

A. Microbiology
    1. Etiologic agent: *Trichomonas vaginalis* - flagellated anaerobic protozoa
        a) The only protozoan that infects the genital tract
        b) *T. vaginalis* has four free flagellae and one flagella embedded in an undulating membrane. The flagellae are responsible for the jerky motility of *T. vaginalis*.
    2. Associations with:
        a) Pre-term rupture of membranes, pre-term delivery, pelvic inflammatory disease
        b) Increased risk of HIV acquisition

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Image: *Trichomonas vaginalis*

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III. Clinical Manifestations

[Slide 74]

A. Clinical presentation and symptoms in women
    1. Vaginitis
        a) Frothy gray or yellow-green vaginal discharge
        b) Pruritus
        c) Cervical petechiae ("strawberry cervix") - classic presentation, but occurs in <2% of cases

2. May also infect Skene's glands and urethra, where the organisms may not be susceptible to topical therapy.
3. May be asymptomatic in women.

[Slide 75]
Image: “Strawberry cervix” due to *T. vaginalis*

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B. *T. vaginalis* in males
   1. May cause up to 11%-13% of nongonococcal urethritis (NGU) in males, but urethral infection is frequently asymptomatic.
   2. Urethral trichomoniasis has been associated with increased shedding of HIV in HIV-infected men.

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IV. Diagnosis

[Slides 78-79]
In the clinical setting, the diagnosis of trichomoniasis is made using the following diagnostic methods:

Females:

A. **Motile** trichomonads seen in saline wet mount (usual mode of diagnosis). Compared to culture, sensitivity varies from 42%-70% depending upon the experience of the microscopist and specimen collection technique. White blood cells are frequently seen. Microscopy should be performed as soon as possible after obtaining the specimen. Trichomonads, especially if the specimen is old, may closely resemble white blood cells. White blood cells can also be confused with trichomonads, so motility is required for positive identification.
B. Vaginal pH >4.5 is often present.
C. Culture (Diamond's media or InPouch TV) is the “gold standard.”
D. Pap smear has limited sensitivity and low specificity; therefore, it cannot be used to reliably diagnose trichomonal vaginitis.
E. DNA probe (now available) has sensitivity higher than wet prep, but are also more expensive and not widely available.
F. Rapid test has sensitivity higher than wet prep.

Males:

G. Trichomoniasis in men is diagnosed by obtaining first void urine concentrated 10x and examining for motile trichomonads; a urethral swab or 10 cc of first-void urine may also be obtained for culture. Multiple specimens (urethral, urine, semen) may be necessary to increase diagnostic sensitivity.

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Image: Wet Prep: Trichomoniasis

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V. Patient Management

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A. Treatment
    1. CDC-recommended regimen
        a) Metronidazole 2 g orally in a single dose or Tinidazole 2 g orally in a single dose
        b) Alternate regimen: metronidazole 500 mg twice a day for 7 days

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    2. Pregnancy: CDC-recommended regimen
        a) Metronidazole 2 g orally in a single dose
        b) No consistent association between metronidazole use in pregnancy and teratogenic effects; treatment may be administered throughout pregnancy
        c) Some trials suggest the possibility of increased prematurity or low birth weight after metronidazole treatment. However, no definitive conclusions exist regarding risks of treatment during pregnancy.

[Slide 84]

B. Treatment failure
    1. A common reason for treatment failure is reinfection. Therefore, it is critical to assure treatment of sex partners.
    2. If treatment failure occurs with metronidazole 2 g orally single dose, the patient and partner(s) can be treated with metronidazole 500 mg orally twice daily for 7 days or tinidazole 2 g orally single dose
    3. For patients experiencing failure of either of these regimens, consider retreatment with tinidazole or metronidazole 2 g orally once a day for 5 days
    4. If repeated treatment failures occur on higher dose regimen and all potential partners have been treated, contact Division of STD Prevention at CDC for metronidazole-susceptibility testing (telephone: 770-488-4115; website: www.cdc.gov/std)
C. Metronidazole has a 90%-95% cure rate and tinidazole has an 86-100% cure rate. Metronidazole gel (intravaginal) is not efficacious for trichomoniasis and is not recommended for treatment.
D. Test for other STDs.

[Slide 85]

VI. Prevention

[Slide 86]

A. Partner management
    1. All sex partners should be treated.
    2. All patients with trichomoniasis should be treated (whether symptomatic or asymptomatic).
    3. Patients should be instructed to avoid sex until they and their sex partners are cured. In the absence of a microbiologic test of cure, this means when therapy has been completed and patient and partner(s) are asymptomatic.

[Slide 87]

B. Patient counseling and education
   1. Nature of the infection
      a) Education regarding normal vs. abnormal discharge
      b) *T. vaginalis* may persist for months or years in epithelial crypts and periglandular areas.
      c) Both men and women can be asymptomatic.
      d) *T. vaginalis* has been associated with adverse outcomes of pregnancy and PID.
      e) Douching may worsen vaginal discharge.
   2. Transmission issues
      a) Trichomoniasis is almost always sexually transmitted. Fomite transmission is rare.
      b) Sex partners should be treated.
      c) Patients should abstain from intercourse until they and their sex partners are cured.

[Slide 88]

   3. Risk reduction

      The clinician should:
      a) Assess client's behavior-change potential.
      b) Develop individualized risk-reduction plans with the patient.
      c) 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 trichomoniasis.

[Slide 89]

CASE STUDY

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

[Slide 90]

History

- 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 1 year ago
- Last check up 1 year ago

[Slide 91]

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

[Slide 92]

1. What is your differential diagnosis based on history and physical examination?

- Vaginitis--Vaginitis caused by trichomoniasis, bacterial vaginosis, or vulvovaginal candidiasis is usually characterized by a vaginal discharge, vulvar itching or irritation, and a vaginal odor.
- Chlamydia –Chlamydia is usually asymptomatic and cannot be diagnosed clinically. With the history of unprotected sex and the epidemiology of chlamydia, it must be considered.
- Gonorrhea—Gonorrhea can be asymptomatic and cannot be diagnosed clinically. With the history of unprotected sex and the epidemiology of gonorrhea, it cannot be ruled out.

2. Based on the differential diagnosis of vaginitis, what is the etiology?

Unknown at this time. In addition to a physical examination and visual inspection of the vagina, an appropriate evaluation of vaginitis requires a collection of a specimen of the discharge for examination under a microscope. It is premature to diagnose the etiology without this missing piece.

Possible etiologic agents include the following. However, none of them can be confirmed without examination of the discharge specimen.

- *Trichomonas vaginalis*, which should be suspected in the presence of frothy gray or yellow-green vaginal discharge, pruritis, or cervical petuchae.
- *Candida albicans*, which should be suspected in the presence of thick, white, curdy (cottage cheese-like) vaginal discharge. Vulvar pruritis, erythema, irritation, and an occasional erythematous "satellite" lesion may occur. External dysuria is another common symptom of VVC.
- Bacterial vaginosis, which is associated with a malodorous vaginal discharge that is reported more commonly after sexual intercourse or menses.

3. Which laboratory tests should be offered or performed?

Appropriate responses include the following:

- Vaginal saline wet mount – Vaginal saline wet mount could show trichomonads and clue cells.
- KOH wet mount – The KOH wet mount could show budding yeast hyphae
- "Whiff" test – The "whiff" test could elicit the fishy odor of amines.
- Vaginal fluid pH – Elevated in BV and trichomoniasis.
- Chlamydia – A chlamydia test is appropriate because of the high prevalence of chlamydial infection in young women and its asymptomatic nature. CDC recommends that all sexually active women age 25 and under be screened for chlamydia on an annual basis, so testing this woman depends on when she was last screened and her risk assessment for recent STD acquisition.
- Testing for other STDs - Depending on prevalence rates and the patient's behavioral risk factors, one may also consider screening for gonorrhea and syphilis and offering HIV testing.
- Counseling and testing for HIV- The history of risky sexual behavior is an indication for offering HIV testing.

[Slide 93]

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 hyphae

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

Trichomoniasis has been diagnosed and candida has been reasonably ruled out. KOH prep will only detect fungal elements on average in 50-85% of women whose vaginitis turns out to be yeast. The normal vaginal pH is 3.8–4.2.

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

Metronidazole 2 g orally in a single dose

[Slide 94]
Partner Management

Tanya has had 2 sex partners within the past year:

Jamie
Last sexual contact: 2 days ago
First sexual contact: 2 months ago
Frequency, exposure type: Twice a week, vaginal sex

Calvin
Last sexual contact: 6 months ago
First sexual contact: 7 months ago
Frequency, exposure type: 3 times a week, vaginal and oral sex

6. How should Jamie and Calvin be managed?

Ensuring the treatment of male partners results in relief of symptoms, microbiologic cure, and reduction of transmission. Trichomoniasis may be asymptomatic in both men and women.

Jamie should be treated, and Tanya and Jamie should avoid sex until both are cured (therapy is complete and they are asymptomatic).

Since Calvin and Tanya have not had sex in 6 months, Calvin is probably not related to this infection.

[Slide 95]
Follow-Up
Tanya was prescribed metronidazole 2 g orally, and she was instructed to abstain from sexual intercourse until her partner was treated.

She returned to clinic 2 weeks later. She reported taking her medication, but still 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 chlamydia test was negative. GC culture was negative.

The vaginal wet mount again revealed motile trichomonads.

7. What is the appropriate therapy for Tanya now?

Metronidazole 500 mg twice a day for 7 days or tinidazole 2g single dose. If treatment failure occurs with one recommended regimen, the patient should be retreated with the other regimen.

If treatment failure occurs after 1 treatment attempt with each of the two regimens, the patient should be retreated with tinidazole or metronidazole 2 g once a day 5 days.

8. What are the appropriate prevention and counseling messages for Tanya?

- Patients should be instructed to avoid sex until they and their sex partners are treated and cured.
- In the absence of a microbiologic test of cure, "cured" is when therapy has been completed and patient and partner(s) are asymptomatic.
- Clarify that trichomoniasis is almost always sexually transmitted, and fomite transmission is rare.
- Discuss individual risk reduction and prevention strategies, including abstinence, monogamy, and condoms.
- Inform the patient that latex condoms can reduce the risk of transmission of trichomoniasis when used consistently and correctly.
- Alcohol should be avoided when metronidazole is used for treatment.
- Hormonal contraceptives offer no protection from STDs and HIV infection.
- Offer HIV counseling and testing.

TEST QUESTIONS

1. Which of the following statements is true about the vaginal ecosystem?
   a) The normal vaginal flora is made up mostly of gardnerella.
   b) Normal vaginal discharge is colorless, odorless, and has a low viscosity.
   c) Lactobacilli convert glucose to ascorbic acid.
   d) **Lactobacilli may produce hydrogen peroxide which inhibits bacterial growth.**

2. Which of the following types of vaginitis occurs most frequently?
   a) **Bacterial vaginosis**
   b) Candidiasis
   c) Trichomoniasis
   d) Atrophic vaginitis

3. The diagnosis of vaginitis requires which of the following?
   a) Patient history
   b) Visual inspection of vaginal discharge
   c) Collection of specimen of vaginal discharge for microscopic examination
   d) **All of the above**

4. The normal vaginal pH is:
   a) 3.8-4.2
   b) 5.0-6.0
   c) 6.0-7.0
   d) 2.5-3.5

5. Which of the following best describes the signs and symptoms of trichomoniasis in women?
   a) Foul fishy odor, and thick clumpy white vaginal discharge
   b) Malodorous, frothy yellow-green vaginal discharge
   c) Dysuria, and thin milky-white vaginal discharge
   d) None, the condition is asymptomatic in women.

6. Which of the following statements is **NOT** true about *Trichomonas vaginalis*?
   a) **Fomite transmission is frequent.**
   b) Sexual transmission is frequent.
   c) Sex partners should be treated.
   d) Patients are considered cured when patients and partners have been treated and are asymptomatic.

7. The usual method of trichomoniasis diagnosis is:
   a) Vaginal pH
   b) KOH “whiff” test
   c) Motile trichomonads seen on a saline wet mount
   d) Pap smear

8. The CDC-recommended treatment for trichomoniasis in non-pregnant women and in men is:
   a) Miconazole 100 mg vaginal suppository, 1 suppository for 7 days
   b) Metronidazole 2 g orally as one-time single dose
   c) Metronidazole 500 mg orally twice a day for 7 days
   d) Clindamycin 300 mg orally twice a day for 7 days

9. The CDC recommends that pregnant women with trichomoniasis be treated with:
   a) Miconazole 100 mg vaginal suppository, 1 suppository for 7 days
   b) Metronidazole 2 g orally as one-time single dose
   c) Metronidazole 500 mg orally as twice a day for 7 days
   d) Clindamycin 300 mg orally twice a day for 7 days

10. When may sex partners resume sexual intercourse after treatment for trichomoniasis?
   a) When they are both cured or when therapy has been completed and both are asymptomatic.
   b) Six months after both have completed therapy and the microbial tests are negative.
   c) Partners may continue sexual practices as long as both are being treated and they use appropriate barrier methods.

11. Most cases of candidiasis are caused by:
   a) *C. albicans*
   b) *C. glabrata*
   c) *C. parapsilosis*
   d) *T. vaginalis*

12. Which of the following best describes the signs and symptoms of candidiasis in women?
   a) External dysuria, pruritis, and thick, clumpy white vaginal discharge
   b) Foul fishy odor, frothy yellow-green vaginal discharge
   c) Malodorous and thin milky-white vaginal discharge
   d) None, the condition is asymptomatic in women.

13. The preferred method for candidiasis diagnosis is:
   a) KOH “whiff” test
   b) Culture
   c) KOH wet mount
   d) Pap smear

14. Which of the following is recommended for the treatment of uncomplicated vulvovaginal candidiasis?
   a) **Any azole treatment regimen including single- or multiple-dose vaginally or single-dose orally**

b) Fluconazole 150 mg oral tablet repeated in 72 hours
c) Itraconazole 100 mg daily for 3 days
d) Ketoconazole 100 mg daily for 3 days

15. Which of the following is true about treatment of male partners of women with candidiasis?
    a) A majority of male partners have balanitis and should be treated.
    b) Treatment of male partners should be topical.
    c) **Treatment of male partners is not usually recommended.**
    d) Oral regimens are more effective in men.

16. Complicated VVC can be characterized by which of the following?
    a) Sporadic and non-recurrent
    b) Non-immunocompromised
    c) **Recurrent**
    d) Mild to moderate symptoms

17. What is the recommended treatment for uncomplicated vulvovaginal candidiasis in pregnancy?
    a) Fluconazole 150 mg in a single dose
    b) **Topical agents only**
    c) Itraconazole 100 mg in a single dose
    d) Ketoconazole 100 mg in a single dose

18. Bacterial vaginosis may occur when there is a loss of protective:
    a) Antibodies
    b) **Lactobacilli**
    c) Mucus
    d) Antigens

19. Which of the following best describes the signs and symptoms of bacterial vaginosis in women?
    a) External dysuria, discomfort, and thick clumpy white vaginal discharge
    b) Malodorous, frothy yellow-green vaginal discharge
    c) **Foul fishy odor and thin milky-white vaginal discharge**
    d) None, the condition is asymptomatic in women.

20. Bacterial vaginosis has been associated with which of the following?
    a) PID
    b) Premature rupture of membranes
    c) Acquisition of HIV
    d) **All of the above**

21. The following statements are true for which type of vaginitis: “Less than 25% of the time it is accompanied by a malodorous vaginal discharge; has a high recurrence rate; symptoms, if present, are more noticeable after sexual intercourse.”
    a) Trichomoniasis

b) **Bacterial vaginosis**
c) Candidiasis
d) Chlamydia

22. What is a recommended treatment for bacterial vaginosis in pregnant women?
    a) Metronidazole 2 g orally in a single dose
    b) Metronidazole 500 mg orally 2 times a day for 14 days
    c) Clindamycin ovules 100 mg intravaginally at bedtime for 3 days
    d) **Metronidazole 250 mg 3 times a day for 7 days**

23. What is the most likely vaginitis diagnosis based on the following criteria: pH 5.0; clue cells > 20% per HPF; KOH "whiff test" positive; and homogenous discharge?
    a) Trichomoniasis
    b) Candidiasis
    c) **Bacterial vaginosis**
    d) Chlamydia

24. The Amsel criteria used in the diagnosis of bacterial vaginosis includes all of the following except:
    a) Vaginal pH >4.5
    b) Presence of clue cells on wet mount
    c) Positive "whiff" test
    d) Numerous WBCs

25. Risk reduction messages for women with bacterial vaginosis would include which of the following?
    a) **Avoid douching**
    b) Treatment of all sexual partners
    c) Abstain from sex
    d) Annual screening of all women

RESOURCES

Publications

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Websites and Other Resources

1. CDC, Division of STD Prevention: **www.cdc.gov/std**
2. National Network of STD/HIV Prevention Training Centers: **http://depts.washington.edu/nnptc/**
3. 2006 CDC STD Treatment Guidelines (including downloadable version for Palm devices): **http://www.cdc.gov/STD/treatment/**
4. STD information and referrals to STD clinics
   CDC-INFO
   1-800-CDC-INFO (800-232-4636)
   TTY: 1-888-232-6348
   In English, en Español
5. CDC National Prevention Information Network (NPIN): **www.cdcnpin.org**
6. American Social Health Association (ASHA): **www.ashastd.org**