

Sexually Transmitted Diseases in Review: The 2002 DC STD Treatment Guidelines

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SEXUALLY TRANSMITTED DISEASES (STDs) are among the most common infectious diseases in the United States today. More than 20 STDs have now been identified, and they affect more than 13 million men and women in this country each year. Equally startling is the price tag associated with their prevention and treatment in the clinical setting: the National Institute of Allergy and Infectious Diseases of the National Institutes of Health reckons that the annual comprehensive cost of STDs in the U.S. alone is in excess of \$10 billion.

Because of the vital role clinicians play in the identification and management of STDs, the U.S. Centers for Disease Control and Prevention (CDC) has long been aware of the need to identify options that will best translate into effective prevention and treatment. One particularly useful resource has been the development of STD Treatment Guidelines, which were updated and published by the CDC in May 2002 (U.S. Centers for Disease Control and Prevention, 2002).

The most recent incarnation of the Guidelines is the product of evidence-based deliberations by the CDC, in consultation with public- and private-sector professionals knowledgeable in the treatment of patients with STDs. They are applicable to various patient-care settings, including family planning clinics, private physicians' offices, managed care organizations, and other primary-care facilities. Although the Guidelines are largely concerned with the clinical manifestations and treatment of STDs, they also stress the importance of the role of the health-care provider in controlling the spread of disease in given communities.

This article reviews six common STDs—genital herpes, syphilis, gonorrhea, chlamydia, trichomoniasis, and bacterial vaginosis—that can be considered in broad groups according to whether their major

initial manifestations are 1) genital sores; 2) urethritis or cervicitis; or 3) vaginal discharge. The diagnostic and treatment recommendations, unless otherwise noted, reflect those specified by the CDC in the 2002 update.

Diseases Characterized by Genital Sores

SIX SEXUALLY TRANSMITTED DISEASES ARE associated with genital sores. The appearance of the lesions, the natural history, and laboratory findings allow distinctions among the possible causes in most instances. The two most common and significant infections in North America are genital herpes simplex virus infection and syphilis, both of which are discussed here.

Genital Herpes

GENITAL HERPES DIFFERS FROM OTHER STDs in its tendency for spontaneous recurrence. Of the two types of herpes simplex virus (HSV), HSV-2 is the more frequent cause of genital disease.

Primary genital lesions develop two to seven days after contact with infected lesions. In males, painful vesicles classically appear on the glans or penile shaft; in females, they typically occur on the vulva, perineum, buttocks, cervix, or vagina. Perianal and anal HSV infections are also common, particularly in men who have sex with men.

The precipitating events associated with genital recurrence of HSV signs and symptoms are poorly understood. In otherwise healthy individuals, physical stress or menstruation may be implicated. Certainly, in HIV-positive individuals, immune suppression can play a significant role in the response to therapy and recurrence of genital herpes lesions. In this way, chronic herpes simplex—defined as lesions that last longer than one month or the development of HSV-related bronchitis, pneu-

monitis, or esophagitis—is an AIDS-defining illness, as specified by the CDC.

Isolation of HSV in cell culture is the preferred virologic test in patients who present with genital vesicles or other mucocutaneous lesions. The sensitivity of culture declines rapidly as lesions begin to heal, usually within a few days of onset. Some HSV antigen detection tests, unlike culture and the direct fluorescent antibody test, do not distinguish HSV-1 from HSV-2. PCR assays for HSV-DNA are highly sensitive, but their role in the diagnosis of genital ulcer disease has not been fully elucidated. However, PCR is available in some laboratories and is the test of choice for detecting HSV in spinal fluid for diagnosis of HSV infection of the central nervous system (CNS). Cytologic detection of cellular changes of herpes virus infection is insensitive and not type-specific, either in genital lesions (Tzanck preparation) or cervical Pap smears, and should not be relied on for diagnosis of HSV infection.

As for immunoassays, both type-specific and nonspecific antibodies to HSV develop during the first several weeks following infection and persist indefinitely. Because nearly all HSV-2 infections in adolescents and adults are sexually acquired, type-specific HSV-2 antibody almost always indicates anogenital infection, but the presence of HSV-1 antibody does not reliably distinguish anogenital from orolabial infection. Accurate type-specific assays for HSV antibodies must be based on the HSV-specific glycoprotein G2 for the diagnosis of infection with HSV-2 and glycoprotein G1 for diagnosis of infection with HSV-1. Such assays first became commercially available in 1999. Still, older assays that do not accurately distinguish HSV-1 from HSV-2 antibody, despite claims to the contrary, remain on the market. Therefore, the serologic type-specific gG-based assays should be specifically requested when serology is performed.

Antiviral treatment offers benefits to

TABLE 1. Recommended Treatments for Genital HSV Infection

First-Episode HSV Infection

- Acyclovir (400 mg orally three times a day for 7–10 days); or
- Acyclovir (200 mg orally five times a day for 7–10 days); or
- Famciclovir (250 mg orally three times a day for 7–10 days); or
- Valacyclovir (1 g orally twice a day for 7–10 days).

Recurrent Symptomatic Episodes

- Acyclovir (400 mg orally three times a day for 5 days); or
- Acyclovir (200 mg orally five times a day for 5 days); or
- Acyclovir (800 mg orally twice a day for 5 days); or
- Famciclovir (125 mg orally twice a day for 5 days); or
- Valacyclovir (500 mg orally twice a day for 5 days); or
- Valacyclovir (1000 mg orally once daily for 5 days)

Daily Suppressive Therapy

- Acyclovir (400 mg orally twice a day); or
- Famciclovir (250 mg orally twice a day); or
- Valacyclovir (500 mg orally once a day); or
- Valacyclovir (1000 mg orally once a day).

Treatment of Episodic HSV Infection in HIV

- Acyclovir (400 mg orally three times a day for 5–10 days); or
- Acyclovir (200 mg orally five times a day for 5–10 days); or
- Famciclovir (500 mg orally twice a day for 5–10 days); or
- Valacyclovir (1.0 g orally twice a day for 5–10 days).

Daily Suppressive Treatment of HSV Infection in HIV

- Acyclovir (400–800 mg orally twice to three times a day); or
- Famciclovir (500 mg orally twice a day); or
- Valacyclovir (500 mg orally twice a day).

most symptomatic patients if it is initiated promptly following the onset of symptoms (see Table 1). In addition, counseling regarding the natural history of genital herpes, sexual and perinatal transmission, and methods to reduce transmission is integral to clinical management.

Syphilis

SYPHILIS IS CAUSED BY THE SPIROCHETE *Treponema pallidum*, a bacterium that penetrates broken skin or mucous membranes, usually through sexual contact. While morbidity and mortality concerns associated with syphilis are serious in their own right, it is equally important to recognize that the genital and oral chancres that develop during the primary stage of syphilis facilitate the spread and acquisition of HIV infection. In fact, studies have shown a strong correlation between high rates of syphilis and increased rates of HIV infection within a sexually active population.

Syphilis is often diagnosed when a pa-

tient presents with symptoms of either primary infection (e.g., painless ulcer or chancre at the infection site), secondary infection (e.g., manifestations that include but

are not limited to skin rash, mucocutaneous lesions, and lymphadenopathy), or tertiary infection (e.g., cardiac, ophthalmic, auditory abnormalities, and gummatous lesions). The latent or asymptomatic stage of infection can essentially be divided into subcategories: Syphilis acquired within the preceding year is referred to as early latent syphilis, whereas all other cases are either late latent syphilis or latent syphilis of unknown duration. Treatment for both late latent syphilis and tertiary syphilis theoretically may require a longer duration of therapy because organisms are dividing more slowly; however, the validity of this concept has not been assessed.

It is also important to recognize that central nervous system disease can occur during any stage of syphilis in HIV. A patient who has clinical evidence of neurologic involvement with syphilis (e.g., cognitive dysfunction, motor or sensory deficits, ophthalmic or auditory symptoms, cranial nerve palsies, and symptoms or signs of meningitis) should have a cerebrospinal fluid (CSF) examination.

Darkfield examinations or direct fluorescent antibody tests of lesion exudate or tissue are the definitive methods for diagnosing early syphilis. A serologic diagnosis is possible with the use of two types of serologic tests for syphilis: a) non-treponemal tests (e.g., Venereal Disease Research Laboratory [VDRL] and Rapid Plasma Reagin [RPR]), and b) treponemal tests (e.g., fluorescent treponemal antibody absorbed [FTA-ABS] and *T. pallidum* particle agglutination [TP-PA]). The use of only one type of serologic test is insufficient

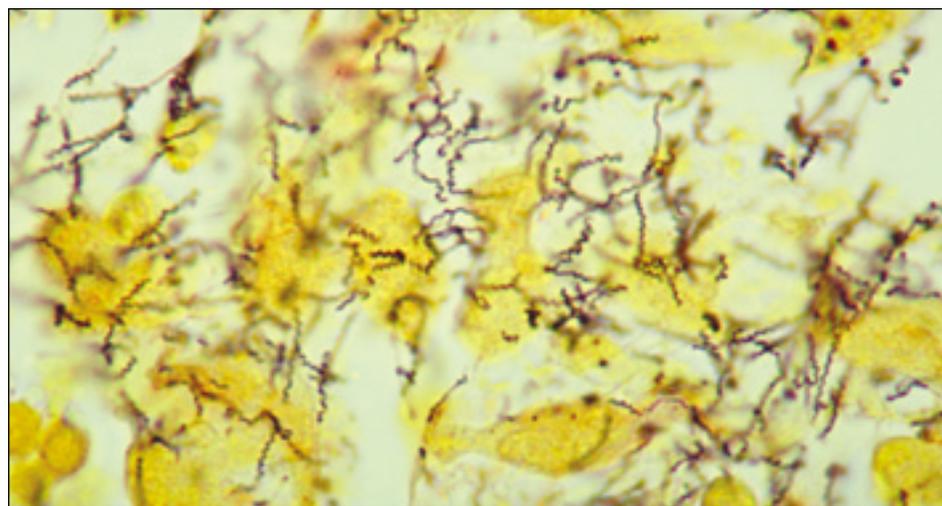


FIGURE 1. Histopathology Showing *Treponema Pallidum* Spirochetes in Testis of Experimentally Infected Rabbit

Source: Public Health Image Library, U.S. Centers for Disease Control and Prevention.

TABLE 2. Recommended Treatments for Syphilis**Primary and Secondary Syphilis*** Benzathine penicillin G (2.4 million units IM in a single dose).**Early Latent Syphilis** Benzathine penicillin G (2.4 million units IM in a single dose).**Late Latent Syphilis or Latent Syphilis of Unknown Duration** Benzathine penicillin G (7.2 million units total, administered as three doses of 2.4 million units IM each at one-week intervals).**Tertiary Syphilis** Benzathine penicillin G (7.2 million units total, administered as three doses of 2.4 million units IM each at one-week intervals).**Neurosyphilis—Recommended Regimen** Aqueous crystalline penicillin G (18 to 24 million units per day, administered as 3 to 4 million units IV every 4 hours or continuous infusion, for 10–14 days).**Neurosyphilis—Alternative Regimen** Procaine penicillin (2.4 million units IM once daily), plus Probenecid (500 mg orally four times a day, both for 10–14 days).

* Treatment with benzathine penicillin G, 2.4 million units IM in a single dose is also the recommended dose for HIV-positive patients with primary or secondary syphilis. However, some specialists recommend additional treatments (eg., benzathine penicillin G administered at one-week intervals for 3 weeks, as recommended for late syphilis) in addition to benzathine penicillin G 2.4 million units IM.

for diagnosis, because false-positive nontreponemal test results may occur secondary to various medical conditions.

As reviewed in the 2002 Guidelines, nontreponemal test antibody titers usually correlate with disease activity, and results should be reported quantitatively. A four-fold change in titer, equivalent to a change of two dilutions (e.g., from 1:4 to 1:16, 1:8 to 1:32, etc.), is considered necessary to demonstrate a clinically significant difference between two nontreponemal test results that were obtained using the same serologic test. Sequential serologic tests in individual patients should be performed by using the same testing method (eg., VDRL or RPR), preferably by the same laboratory. The VDRL and RPR are equally valid assays, but quantitative results from the two tests cannot be compared directly because RPR titers often are slightly higher than VDRL titers. Nontreponemal tests usually become nonreactive with time after treatment; in some patients, however, nontreponemal antibodies can persist at a low titer for a long period of time, sometimes for the life of the patient. This response is referred to as the “serofast reaction” and does not require retreatment unless a titer increase of twofold or greater occurs.

It is important to note that unusual serologic responses have been observed among HIV-infected individuals with syphilis. These reports generally have involved serologic titers that were higher

than expected, but false-negative serologic test results and delayed appearance of seroreactivity also have been reported. However, aberrant serologic responses are still uncommon, and most specialists believe that both treponemal and nontreponemal serologic tests for syphilis can be interpreted in the usual manner for the vast majority of patients who are infected with HIV.

With respect to treatment, parenteral penicillin G has been used effectively for more than 50 years to achieve clinical resolution—whether the resolution of symptoms or the prevention of sexual transmission—and to prevent late-stage manifestations. The CDC-recommended treatments for primary, secondary, latent, tertiary, and neurosyphilis are reviewed in Table 2.

Two significant adverse outcomes of treatment for primary, secondary, or tertiary infection are penicillin allergy and the Jarisch-Herxheimer reaction. While the former is usually associated with anaphylaxis, hypotension, laryngeal edema, angioedema, and urticaria, whereas the latter usually manifests as a generalized febrile illness, there can be some confusion as to which adverse reaction has occurred. As a rule of thumb, however, an allergic reaction to penicillin typically occurs within minutes to hours after intramuscular or intravenous penicillin has been administered, whereas the Jarisch-Herxheimer reaction typically occurs several hours lat-

er and does not recur with subsequent penicillin treatments.

Compared with HIV-negative patients, HIV-positive patients who have early syphilis may be at increased risk for neurologic complications and treatment failure with currently recommended regimens. Nevertheless, the CDC Guidelines underscore that the magnitude of these risks is likely minimal and points out that no treatment regimens for syphilis have been demonstrated to be more effective in preventing neurosyphilis in HIV-infected patients than the syphilis regimens recommended for HIV-negative patients. Still, some specialists recommend additional doses of benzathine penicillin G (e.g., 2.4 million units administered once a week for three weeks) to treat early syphilis. Follow-up testing also remains an essential component of treating primary and secondary syphilis in HIV-positive patients. Such patients should be evaluated clinically and serologically for treatment failure at 3, 6, 9, 12, and 24 months after therapy.

Diseases Characterized by Urethritis and Cervicitis

Gonorrhea

IN 2000, 358,995 CASES OF GONORRHEA—caused by the gram-negative, kidney bean-shaped diplococcus *Neisseria gonorrhoea*—were reported to the CDC. Approximately 75% of all reported cases of gonorrhea in the United States is found in young people, usually between the ages of 15 and 29 years. The highest rates of infection are usually found in 15- to 19-year-old women and 20- to 24-year-old men.

Among men who develop symptomatic urethritis, symptoms such as spontaneous purulent discharge and severe dysuria typically develop two to seven days after exposure. Other complications in men include epididymitis, posterior urethritis, seminal vesiculitis, and infections of the Cowper’s and Tyson’s glands.

Acute and chronic prostatitis can also occur and must be approached carefully by the examiner. Gonococcal infection of the prostate is often painful to the patient and renders the organ enlarged and hot to the touch. It is important not to palpate the prostate during a DRE, as this can result in the release of *N. gonorrhoea* from the prostate and cause septicemia.

Among women, cervicitis is the most common manifestation, which includes symptoms that mimic many other lower genital tract infections such as copious yellow vaginal discharge, dysuria, intermenstrual uterine bleeding, and menorrhagia. Approximately 20% of women with gonococcal cervicitis develop pelvic inflammatory disease, usually beginning at a time close to the onset of menstruation. PID by definition encompasses endometritis, salpingitis (which can cause tubal occlusion and sterility), and/or pelvic peritonitis.

Both men and women can acquire anorectal or pharyngeal gonococcal infection. Common symptoms of anorectal involvement include rectal pain, tenesmus, mucopurulent discharge, and bleeding. Pharyngeal gonorrhoea can also occur, with evidence of pharyngitis often seen during visual inspection.

There is also the possibility of disseminated gonococcal infection (DGI). Most patients with DGI do not have symptoms of urogenital, anorectal, or pharyngeal disease. The most frequently reported symptoms of DGI are fever, arthralgias, skin lesions (usually between three and 20), or joint involvement (gonococcal arthritis).

The most sensitive and specific test for detecting gonococcal infection is direct culture from genital, rectal, or pharyngeal sites. Under quality-controlled conditions, the sensitivity of culture is high for both male and female anogenital gonorrhoea, and for pharyngeal gonococcal infections. Sensitivity of intracellular gram-negative

TABLE 3. Recommended Treatments for Uncomplicated Gonococcal Infections

Uncomplicated Gonococcal Infections of the Cervix, Urethra, and Rectum

- Cefixime (400 mg orally in a single dose); or
- Ceftriaxone (125 mg IM in a single dose); or
- Ciprofloxacin (500 mg orally in a single dose)*; or
- Ofloxacin (400 mg orally in a single dose)*; or
- Levofloxacin (250 mg orally in a single dose)*

Alternative Regimens

- Spectinomycin (2 g IM in a single dose) is useful for persons who cannot tolerate cephalosporins or quinolones, and for pregnant women who cannot tolerate cephalosporins.
- Single-dose cephalosporin regimens such as ceftizoxime, cefoxitin, and cefotaxime; or
- Single-dose quinolone regimen such as gatifloxacin, norfloxacin, and lornefloxacin

Gonococcal Infections of the Pharynx

- Ceftriaxone (125 mg IM in a single dose); or
- Ciprofloxacin (500 mg orally in a single dose)*

PLUS: If Chlamydial Infection is not Ruled Out

- Azithromycin (1 g orally in a single dose); or
- Doxycycline (100 mg orally twice a day for 7 days). *

* Quinolones should not be used for infections acquired in Asia or the Pacific, including Hawaii. In addition, use of quinolones is probably inadvisable for treating infections acquired in California and in other areas with increased prevalence of quinolone resistance.

testing or cultures on Thayer-Martin or NYC agar media may be limited by inadequate clinical specimens, improper storage, transport or processing, and inhibition of growth by antibiotics in selective culture mediums. DNA probes and enzyme

immunoassays (EIA) are currently the most widely used nonculture diagnostic tests, although they are not approved by the U.S. Food and Drug Administration for rectal or pharyngeal testing.

With respect to treatment, the CDC recommends several possible regimens for uncomplicated gonococcal infections of the cervix, urethra, rectum, and pharynx. These recommendations are reviewed in Table 3.

It is important to note that quinolone-resistant *N. gonorrhoeae* (QRNG) continues to spread, making the treatment of gonorrhoea with quinolones inadvisable in many areas. QRNG is common in parts of Asia and the Pacific. In the United States, QRNG is becoming increasingly common in areas on the west coast. Of 5,461 isolates collected by CDC's Gonococcal Isolate Surveillance Project (GISP) during 2000, 19 (0.4%) had minimum inhibitory concentrations (MICs) >1.0 µg/mL to ciprofloxacin. GISP indicated that the resistant isolates made up 0.2% of the samples collected from the 25 cities within the continental United States and Alaska; however, such isolates comprised 14.3% of the Honolulu GISP sample. Because of these

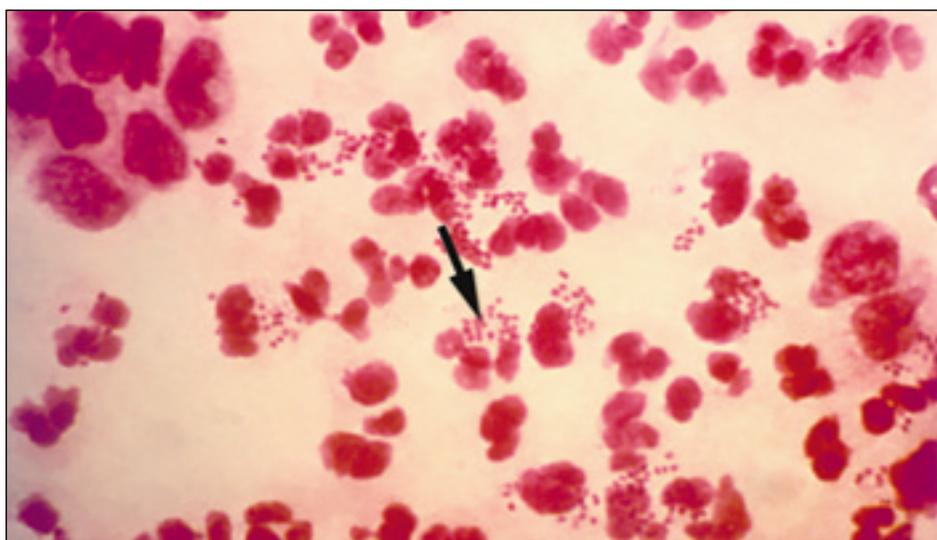


FIGURE 2. *Neisseria Gonorrhoeae* Found in a Male With Urethritis
Photomicrograph of a urethral exudate from a male with urethritis, indicating gram-negative *N. gonorrhoeae* intracellular diplococci.

Source: Public Health Image Library, U.S. Centers for Disease Control and Prevention.

TABLE 4. Recommended Treatments for Uncomplicated Chlamydial Infection

Recommended Regimens

- Azithromycin (1g orally administered as a single dose); or
- Doxycycline (100 mg orally twice a day for 7 days).

Alternative Regimens

- Erythromycin base (500 mg orally four times a day for 7 days); or
- Erythromycin ethylsuccinate (800 mg orally four times a day for 7 days); or
- Ofloxacin (300 mg orally twice a day for 7 days); or
- Levofloxacin (500 mg once daily for 7 days).

Treatment of Chlamydial Infection During Pregnancy*

- Erythromycin base (500 mg orally four times a day for 7 days); or
- Amoxicillin (500 mg orally three times a day for 7 days).

Alternative Regimens For Use During Pregnancy

- Erythromycin base (250 mg orally four times a day for 14 days); or
- Erythromycin ethylsuccinate (800 mg orally four times a day for 7 days); or
- Erythromycin ethylsuccinate (400 mg orally four times a day for 14 days); or
- Azithromycin (1 g orally in a single dose).

* Doxycycline and ofloxacin are contraindicated in pregnant women. However, clinical experience and preliminary data suggest that azithromycin is safe and effective. Repeat testing (preferably by culture) 3 weeks after completion of therapy with the following regimens is recommended for all pregnant women, because these regimens may not be highly efficacious and the frequent side effects of erythromycin might discourage patient compliance with this regimen.

and other data, quinolones are no longer recommended for the treatment of gonorrhea in the State of Hawaii and should not be used to treat infections that may have been acquired in Asia or the Pacific (including Hawaii). Recent data from several GISP sites in California demonstrate an increased prevalence of QRNG; therefore, the use of fluoroquinolones in California is inadvisable. The Guidelines stress that clinicians should obtain a recent travel history, including travel of sex partners, in those persons with gonorrhea for whom a quinolone is being considered.

Unfortunately, it is expected that resistance of *N. gonorrhoeae* to fluoroquinolones and other antimicrobials will continue to spread. In turn, surveillance for antimicrobial resistance is crucial for guiding therapy recommendations. The GISP, which samples cultures from approximately 3% of all U.S. men who have gonococcal infections, is a mainstay of surveillance. However, surveillance by clinicians is also important. Clinicians who evaluate patients with persistent *N. gonorrhoeae* infection despite treatment with a recommended regimen and likely have not been re-exposed, should perform culture and

susceptibility testing of relevant clinical specimens and report the case to the local health department.

The treatment of gonorrhea is the same for both HIV-positive and HIV-negative individuals.

Finally, patients infected with *N. gonorrhoeae* are often coinfecting with *Chlamydia trachomatis* (see next section). This observation has led to the CDC recommendation that patients treated for gonococcal infection also be treated with a regimen effective against uncomplicated genital *C. trachomatis* infection. Routine dual therapy without testing for chlamydia can be cost-effective for populations in which chlamydial infection accompanies 10% to 30% of gonococcal infections, because the cost of therapy for chlamydia is less than the cost of testing.

Chlamydia

AT LEAST AS MANY CASES OF URETHRITIS ARE nongonococcal as gonococcal. *C. trachomatis* causes 30% to 50% of nongonococcal urethritis (NGU). In the U.S., chlamydial genital infection is most common among sexually active adolescents and young adults. The CDC now recommends

that all sexually active adolescent women be screened for chlamydial infection at least annually, even if symptoms are not present. Annual screening of all sexually active women aged 20 to 25 years is also recommended, as is screening of older women with risk factors, such as those who have a new sex partner and those with multiple sex partners.

Some cases of *C. trachomatis*-negative NGU are associated with *Trichomonas vaginalis* infection (see next section).

Ordinarily, the distinction between gonococcal and nongonococcal infections relies on gram-stain examinations or urethral or cervical smears. In a male with urethritis and typical intracellular gram-negative diplococci associated with neutrophils, the diagnosis of gonococcal urethritis is clear-cut and the culture is not necessary, unless sensitivity testing is indicated. However, coincident NGU cannot be excluded. Whenever interpretation of the gram stain is not straightforward in males—and in all females—culture on Thayer-Martin medium is appropriate. Techniques for detecting chlamydial infection are widely available—such as nucleic acid amplification tests (NAATs)—and should be used routinely in evaluating genital infections. NAATs offer the advantage of much higher sensitivity and the ability to diagnose both gonorrhea and chlamydia by urine sample.

Treatments for chlamydia are discussed in Figure 4. Again, coinfection with *C. trachomatis* often occurs among patients who have gonococcal infection; therefore, presumptive treatment of such patients for chlamydia is appropriate (see Table 3).

Patients who have chlamydial infection and also are infected with HIV should receive the same treatment regimen as those who are HIV-negative (Table 4).

Diseases Characterized by Vaginal Discharge

VAGINAL INFECTION IS USUALLY CHARACTERIZED by a vaginal discharge or vulvar itching and irritation; a vaginal odor may be present. The three diseases most frequently associated with vaginal discharge are trichomoniasis (caused by *Trichomonas vaginalis*), bacterial vaginosis (caused by a replacement of the normal vaginal flora by an overgrowth of anaero-

TABLE 5. Recommended Treatments for Trichomoniasis**Recommended Regimen**

- Metronidazole 2 g orally in a single dose.

Alternative Regimens

- Metronidazole 500 mg twice a day for 7 days.

* The nitroimidazoles comprise the only class of drugs useful for the oral or parenteral therapy of trichomoniasis. Of these, only metronidazole is readily available in the United States and approved by the FDA for the treatment of trichomoniasis. In randomized clinical trials, the recommended metronidazole regimens have resulted in cure rates of approximately 90%–95%; ensuring treatment of sex partners might increase this rate. Treatment of patients and sex partners results in relief of symptoms, microbiologic cure, and reduction of transmission. Metronidazole gel has been approved for treatment of BV. However, like other topically applied antimicrobials that are unlikely to achieve therapeutic levels in the urethra or perivaginal glands, it is considerably less efficacious for treatment of trichomoniasis (<50%) than oral preparations of metronidazole. Therefore, metronidazole gel is not recommended for use. Several other topically applied antimicrobials have occasionally been used for treatment of trichomoniasis, but it is unlikely that these preparations have greater efficacy than metronidazole gel.

bic microorganisms, mycoplasmas, and *Gardnerella vaginalis*), and candidiasis (usually caused by *Candida albicans*). Trichomoniasis and bacterial vaginosis are reviewed here.

Trichomoniasis

MOST MEN WHO ARE INFECTED WITH *T. vaginalis* do not have symptoms; others have NGU. Many infected women have symptoms characterized by a diffuse, malodorous, yellow-green discharge with vulvar irritation. However, some women have minimal or no symptoms.

Diagnosis of vaginal trichomoniasis is usually performed by microscopy of vaginal secretions, but this method has a sensitivity of only about 60% to 70%. Culture is the most sensitive commercially available method of diagnosis. No FDA-approved PCR test for *T. vaginalis* is available in the United States, but such testing may be available from commercial laboratories that have developed their own PCR tests.

The CDC recommends metronidazole for the treatment of trichomoniasis, which is reviewed in Table 5.

Bacterial Vaginosis

BACTERIAL VAGINOSIS OCCURS WHEN NORMAL H₂O₂-producing *Lactobacillus* in the vagina is replaced with high concentrations of anaerobic bacteria (eg., *Prevotella* and *Mobiluncus*), *G. vaginalis*, and *Mycoplasma hominis*. While the exact cause of this microbial shift is not fully understood, bacterial vaginosis is most frequently linked to having multiple sex partners, douching, and lack of vaginal lactobacilli.

Bacterial vaginosis is not usually transmitted sexually, but it is included in this

overview because is often diagnosed in women being evaluated for STDs.

Bacterial vaginosis can be diagnosed by the use of clinical and microscopic findings. Clinical criteria for diagnosis of bacterial vaginosis require three of the following: 1) a homogeneous, white, noninflammatory discharge that smoothly coats the vaginal walls; 2) the presence of clue cells on microscopic examination; 3) a pH of vaginal fluid >4.5; or 4) a fishy odor of vaginal discharge before or after addition of 10% KOH (i.e., the whiff test).

Should bacterial vaginosis occur during pregnancy, there is an increased risk of adverse pregnancy outcomes, including premature rupture of the membranes, preterm labor, preterm birth, and post-

partum endometritis. The results of several investigations indicate that treatment of pregnant women who have bacterial vaginosis and who are at high risk for preterm delivery (i.e., those who previously delivered a premature infant) may reduce the risk for prematurity. Therefore, high-risk pregnant women who have asymptomatic BV may be evaluated for treatment.

Some specialists prefer using systemic therapy to treat possible subclinical upper genital tract infections among women at low risk for preterm delivery (i.e., those who have no history of delivering an infant before term). Existing data do not support the use of topical agents during pregnancy. Evidence from three trials suggests an increase in adverse events (e.g., prematurity and neonatal infections), particularly in newborns, after use of clindamycin cream. Multiple studies and meta-analyses have not demonstrated a consistent association between metronidazole use during pregnancy and teratogenic or mutagenic effects in newborns.

Recommended treatments for bacterial vaginosis are reviewed in Table 6. Patients who have bacterial vaginosis and also are infected with HIV should receive the same treatment regimen as those who are HIV-negative. 

References

U.S. Centers for Disease Control and Prevention. **Sexually Transmitted Diseases Treatment Guidelines 2002.** *MMWR* 51(RR-6):1-84, 2002.

TABLE 6. Recommended Treatments for Bacterial Vaginosis**Recommended Regimens**

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

Alternative Regimens

- Metronidazole (2 g orally in a single dose); or
- Clindamycin (300 mg orally twice a day for 7 days); or
- Clindamycin ovules (100 g intravaginally once at bedtime for 3 days).*

Treatment of Bacterial Vaginosis During Pregnancy*

- Metronidazole (250 mg orally three times a day for 7 days); or
- Clindamycin (300 mg orally twice a day for 7 days).

* Clindamycin cream and ovules are oil-based and might weaken latex condoms and diaphragms. Refer to condom product labeling for additional information.