

## Trichomoniasis

Trichomoniasis is the most prevalent nonviral sexually transmitted infection in the United States, affecting an estimated 3.7 million persons (533). Health disparities persist in the epidemiology of *T. vaginalis* infection in the United States: 13% of black women are affected compared with 1.8% of non-Hispanic white women (639). *T. vaginalis* infection affects >11% of women aged ≥40 years (640), and particularly high prevalence has been detected among STD clinic patients (641) (26% of symptomatic women and 6.5% asymptomatic women tested) and incarcerated persons (9%–32% of incarcerated women [135,136,640,642,643] and 2%–9% of incarcerated men) (136,137,644,645). The prevalence of trichomoniasis in MSM is low (646,647).

Some infected men have symptoms of urethritis, epididymitis, or prostatitis, and some infected women have vaginal discharge that might be diffuse, malodorous, or yellow-green with or without vulvar irritation. However, most infected persons (70%–85%) have minimal or no symptoms, and untreated infections might last for months to years (86,639,648,649). Although partners might be unaware of their infection, it is readily passed between sex partners during penile-vaginal sex (650). Among persons who are sexually active, the best way to prevent trichomoniasis is through consistent and correct use of condoms during all penile-vaginal sexual encounters (22). Partners of men who have been circumcised might have a somewhat reduced risk of *T. vaginalis* infection (56,651). Douching is not recommended because it might increase the risk for vaginal infections, including trichomoniasis (652).

*T. vaginalis* infection is associated with two- to threefold increased risk for HIV acquisition (653–656), preterm birth, and other adverse pregnancy outcomes among pregnant women. Among women with HIV infection, *T. vaginalis* infection is associated with increased risk for PID (657–659). Routine screening of asymptomatic women with HIV infection for *T. vaginalis* is recommended because of the adverse events associated with asymptomatic trichomoniasis and HIV infection.

Diagnostic testing for *T. vaginalis* should be performed in women seeking care for vaginal discharge. Screening might be considered for persons receiving care in high-prevalence settings (e.g., STD clinics and correctional facilities) and for asymptomatic persons at high risk for infection (e.g., persons with multiple sex partners, exchanging sex for payment, illicit drug use, or a history of STD). However, data are lacking on whether screening and treatment for asymptomatic trichomoniasis in high prevalence settings or persons at high risk can reduce any adverse health events and health disparities or reduce community burden of infection. Decisions about screening might be informed by local epidemiology of *T. vaginalis* infection.

Whether the rectum can be a reservoir for *T. vaginalis* infection is unclear; data are needed to clarify whether this occasional finding might reflect recent depositing contamination in up to 5% of persons reporting recent receptive anal sex (660,661). Further, the efficacy, benefit, and cost-effectiveness of rectal screening are unknown; therefore, rectal testing for *T. vaginalis* is not recommended. Similarly, oral testing for *T. vaginalis* is not recommended because of a lack of evidence for oral infections. *T. vaginalis* infection is not a nationally notifiable condition in the United States (118,662).

### Diagnostic Considerations

The use of highly sensitive and specific tests is recommended for detecting *T. vaginalis*. Among women, NAAT is highly sensitive, often detecting three to five times more *T. vaginalis* infections than wet-mount microscopy, a method with poor sensitivity (51%–65%) (663,664). The APTIMA *T. vaginalis* assay (Hologic Gen-Probe, San Diego, CA) is FDA-cleared for detection of *T. vaginalis* from vaginal, endocervical, or urine specimens from women. This assay detects RNA by transcription-mediated amplification with a clinical sensitivity of 95.3%–100% and specificity of 95.2%–100% (665,666). Among women, vaginal swab and urine have up to 100% concordance (663). As analyte-specific reagents, this assay can be used with urine or urethral swabs from men if validated per CLIA regulations. The sale, distribution, and use of analyte-specific reagents are allowed under 21 C.F.R. 809.30 pertaining to in vitro diagnostic products for human use. For *T. vaginalis* diagnosis in men, the sensitivity of self-collected penile-meatal swabs was higher than that of urine in one study (80% and 39%, respectively) (667). The BD Probe Tec TV Q<sup>x</sup> Amplified DNA Assay (Becton Dickinson, Franklin Lakes, New Jersey) is FDA-cleared for detection of *T. vaginalis* from endocervical, vaginal, or urine specimens from women. Although it might be feasible to perform these tests on the same specimen used for chlamydia and gonorrhea screening, the epidemiology of trichomoniasis is distinct and should not be overlooked in older adults.

Other FDA-cleared tests to detect *T. vaginalis* in vaginal secretions include the OSOM Trichomonas Rapid Test (Sekisui Diagnostics, Framingham, MA), an antigen-detection test using immunochromatographic capillary flow dipstick technology that can be performed at the point of care, and the Affirm VP III (Becton Dickinson, Sparks, MD), a DNA hybridization probe test that evaluates for *T. vaginalis*, *G. vaginalis*, and *Candida albicans*. The results of the OSOM Trichomonas Rapid Test are available in approximately 10 minutes, with sensitivity 82%–95% and specificity 97%–100% (666,668). Self-testing might become an option, as a study of 209 young women aged 14–22 years found that >99% could correctly perform and interpret her own self-test using the OSOM assay, with a high correlation with clinician interpretation (96% agreement,  $\kappa = 0.87$ ) (669). The results of the Affirm VP III are available within 45 minutes. Sensitivity and specificity are 63% and 99.9%, respectively, compared with culture and TMA; sensitivity might be higher among women who are symptomatic (670,671). Neither the OSOM nor the Affirm VP III test is FDA-cleared for use with specimens obtained from men.

Culture was considered the gold standard method for diagnosing *T. vaginalis* infection before molecular detection methods became available. Culture has a sensitivity of 75%–96% and a specificity of up to 100% (475). In women, vaginal secretions are the preferred specimen type for culture, as urine culture is less sensitive (475,672,673). In men, culture specimens require a urethral swab, urine sediment, and/or semen. To improve yield, multiple specimens from men can be used to inoculate a single culture.

The most common method for *T. vaginalis* diagnosis might be microscopic evaluation of wet preparations of genital secretions because of convenience and relatively low cost. Unfortunately, the sensitivity of wet mount is low (51%–65%) in vaginal specimens (475,666) and lower in specimens from men (e.g., urethral specimens, urine sediment, and semen). Clinicians using wet mounts should attempt to evaluate slides immediately because sensitivity declines as evaluation is delayed, decreasing by up

to 20% within 1 hour after collection (674, 675). When highly sensitive (e.g., NAAT) testing on specimens is not feasible, a testing algorithm (e.g., wet mount first, followed by NAAT if negative) can improve diagnostic sensitivity in persons with an initial negative result by wet mount (475). Although *T. vaginalis* may be an incidental finding on a Pap test, neither conventional nor liquid-based Pap tests are considered diagnostic tests for trichomoniasis, because false negatives and false positives can occur.

## Treatment

Treatment reduces symptoms and signs of *T. vaginalis* infection and might reduce transmission. Likelihood of adverse outcomes in women with HIV also is reduced with *T. vaginalis* therapy.

<i>Recommended Regimen</i>
<b>Metronidazole</b> 2 g orally in a single dose OR
<b>Tinidazole</b> 2 g orally in a single dose
<i>Alternative Regimen</i>
<b>Metronidazole</b> 500 mg orally twice a day for 7 days

Alcohol consumption should be avoided during treatment with nitroimidazoles. To reduce the possibility of a disulfiram-like reaction, abstinence from alcohol use should continue for 24 hours after completion of metronidazole or 72 hours after completion of tinidazole.

The nitroimidazoles are the only class of antimicrobial medications known to be effective against *T. vaginalis* infections. Of these drugs, metronidazole and tinidazole have been cleared by FDA for the oral or parenteral treatment of trichomoniasis. Tinidazole is generally more expensive, reaches higher levels in serum and the genitourinary tract, has a longer half-life than metronidazole (12.5 hours versus 7.3 hours), and has fewer gastrointestinal side effects (676-678). In randomized clinical trials, recommended metronidazole regimens have resulted in cure rates of approximately 84%–98% (679-681), and the recommended tinidazole regimen has resulted in cure rates of approximately 92%–100% (680, 682-685). Randomized controlled trials comparing single 2 g doses of metronidazole and tinidazole suggest that tinidazole is equivalent or superior to metronidazole in achieving parasitologic cure and resolution of symptoms (686).

Metronidazole gel does not reach therapeutic levels in the urethra and perivaginal glands. Because it is less efficacious than oral metronidazole, it is not recommended.

## Other Management Considerations

Providers should advise persons infected with *T. vaginalis* to abstain from sex until they and their sex partners are treated (i.e., when therapy has been completed and any symptoms have resolved). Testing for other STDs including HIV should be performed in persons infected with *T. vaginalis*.

## Follow-up

Because of the high rate of reinfection among women treated for trichomoniasis (17% within 3 months in one study) (86), retesting for *T. vaginalis* is recommended for all sexually active women within 3 months following initial treatment regardless of whether they believe their sex partners were treated (see [Diagnostic Considerations](#)). Testing by nucleic acid amplification can be conducted as soon as 2 weeks after treatment (687, 688). Data are insufficient to support retesting men.

## Management of Sex Partners

Concurrent treatment of all sex partners is critical for symptomatic relief, microbiologic cure, and prevention of transmission and reinfections. Current partners should be referred for presumptive therapy to avoid reinfection. Partners should be advised to abstain from intercourse until they and their sex partners have been adequately treated and any symptoms have resolved. EPT might have a role in partner management for trichomoniasis (97, 98, 689) and can be used in states where permissible by law; however, no one partner management intervention has been shown to be superior in reducing reinfection rates. Though no definitive data exist to guide treatment for partners of persons with persistent or recurrent trichomoniasis in whom nonadherence and reinfection are unlikely, partners benefit from undergoing evaluation and receiving the same regimen as the patient (see [Persistent or Recurrent Trichomoniasis](#)).

## Persistent or Recurrent Trichomoniasis

Persistent or recurrent infection caused by antimicrobial-resistant *T. vaginalis* or other causes should be distinguished from the possibility of reinfection from an untreated sex partner. Although most recurrent *T. vaginalis* infections are thought to result from reinfection, some infections might be attributed to antimicrobial resistance. Metronidazole resistance occurs in 4%–10% of cases of vaginal trichomoniasis (690, 691), and tinidazole resistance in 1% (691). In general, *T. vaginalis* isolates have lower minimum lethal concentrations to tinidazole than metronidazole (692). Emerging nitroimidazole-resistant trichomoniasis is concerning, because few alternatives to standard therapy exist. Single-dose therapy should be avoided for treating recurrent trichomoniasis that is not likely a result of reinfection. If treatment failure has occurred with metronidazole 2 g single dose and reinfection is excluded, the patient (and their partner[s]) can be treated with metronidazole 500 mg orally twice daily for 7 days. If this regimen fails, clinicians should consider treatment with metronidazole or tinidazole at 2 g orally for 7 days. If several 1-week regimens have failed in a person who is unlikely to have nonadherence or reinfection, testing of the organism for metronidazole and tinidazole susceptibility is recommended (693). CDC has experience with susceptibility testing for nitroimidazole-resistant *T. vaginalis* and treatment management of infected persons and can provide assistance (telephone: 404-718-4141; website: [https://www.cdc.gov/laboratory/specimen-submission/detail.html?CDC\\_TestCode=CDC-10239](https://www.cdc.gov/laboratory/specimen-submission/detail.html?CDC_TestCode=CDC-10239) ([https://www.cdc.gov/laboratory/specimen-submission/detail.html?CDC\\_TestCode=CDC-10239](https://www.cdc.gov/laboratory/specimen-submission/detail.html?CDC_TestCode=CDC-10239))). Higher dose tinidazole at 2–3g for 14 days, often in combination with intravaginal tinidazole, can be considered in cases of nitroimidazole-resistant infections; however, such cases should be managed in consultation with an expert.

Alternative regimens might be effective but have not been systematically evaluated; therefore, consultation with an infectious-disease specialist is recommended. The most anecdotal experience has been with intravaginal paromomycin in combination with high-dose tinidazole (694-696); clinical improvement has been reported with other alternative regimens including intravaginal boric acid (697,698) and nitazoxanide (699). The following topically applied agents have shown minimal success (<50%) and are not recommended: intravaginal betadine (povidone-iodine), clotrimazole, acetic acid, furazolidone, gentian violet, nonoxynol-9, and potassium permanganate (700). No other topical microbicide has been shown to be effective against trichomoniasis (701).

## Special Considerations

### Allergy, Intolerance, and Adverse Reactions

Metronidazole and tinidazole are both nitroimidazoles. Patients with an IgE mediated-type allergy to a nitroimidazole can be managed by metronidazole desensitization according to a published regimen (702) and in consultation with a specialist.

### Pregnancy

*T. vaginalis* infection in pregnant women is associated with adverse pregnancy outcomes, particularly premature rupture of membranes, preterm delivery, and delivery of a low birthweight infant (658,703-705). Although metronidazole treatment produces parasitologic cure, certain trials have shown no significant difference in perinatal morbidity following metronidazole treatment. One trial suggested the possibility of increased preterm delivery in women with *T. vaginalis* infection who received metronidazole treatment (706), yet study limitations prevented definitive conclusions regarding the risks of treatment. More recent, larger studies have shown no positive or negative association between metronidazole use during pregnancy and adverse outcomes of pregnancy (634,707-710). If treatment is considered, the recommended regimen in pregnant women is metronidazole 2 g orally in a single dose. Symptomatic pregnant women, regardless of pregnancy stage, should be tested and considered for treatment. Treatment of *T. vaginalis* infection can relieve symptoms of vaginal discharge in pregnant women and reduce sexual transmission to partners. Although perinatal transmission of trichomoniasis is uncommon, treatment also might prevent respiratory or genital infection of the newborn (711,712). Clinicians should counsel symptomatic pregnant women with trichomoniasis regarding the potential risks for and benefits of treatment and about the importance of partner treatment and condom use in the prevention of sexual transmission.

The benefit of routine screening for *T. vaginalis* in asymptomatic pregnant women has not been established. However, screening at the first prenatal visit and prompt treatment, as appropriate, are recommended for pregnant women with HIV infection, because *T. vaginalis* infection is a risk factor for vertical transmission of HIV (713). Pregnant women with HIV who are treated for *T. vaginalis* infection should be retested 3 months after treatment.

Although metronidazole crosses the placenta, data suggest that it poses a low risk to pregnant women (317). No evidence of teratogenicity or mutagenic effects in infants has been found in multiple cross-sectional and cohort studies of pregnant women (708-710,714). Women can be treated with 2 g metronidazole in a single dose at any stage of pregnancy.

Metronidazole is secreted in breast milk. With maternal oral therapy, breastfed infants receive metronidazole in doses that are lower than those used to treat infections in infants, although the active metabolite adds to the total infant exposure. Plasma levels of the drug and metabolite are measurable, but remain less than maternal plasma levels (<http://toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?LACT> (<http://toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?LACT>)). Although several reported case series found no evidence of adverse effects in infants exposed to metronidazole in breast milk, some clinicians advise deferring breastfeeding for 12–24 hours following maternal treatment with a single 2-g dose of metronidazole (635). Maternal treatment with metronidazole (400 mg three times daily for 7 days) produced a lower concentration in breast milk and was considered compatible with breastfeeding over longer periods of time (636,637).

Data from studies involving human subjects are limited regarding use of tinidazole in pregnancy; however, animal data suggest this drug poses moderate risk. Thus, tinidazole should be avoided in pregnant women, and breastfeeding should be deferred for 72 hours following a single 2-g dose of tinidazole (<http://toxnet.nlm.nih.gov/newtoxnet/lactmed.htm>).

### HIV Infection

Up to 53% of women with HIV infection also are infected with *T. vaginalis* (715,716). *T. vaginalis* infection in these women is significantly associated with PID (659), and treatment of trichomoniasis is associated with significant decreases in genital-tract HIV viral load and viral shedding (717,718). For these reasons, routine screening and prompt treatment are recommended for all women with HIV infection; screening should occur at entry to care and then at least annually thereafter. A randomized clinical trial involving women with HIV infection and *T. vaginalis* infection demonstrated that a single dose of metronidazole 2 g orally was less effective than 500 mg twice daily for 7 days (719). Thus, to improve cure rates, women with HIV infection who receive a diagnosis of *T. vaginalis* infection should be treated with metronidazole 500 mg orally twice daily for 7 days (rather than with a 2-g single dose of metronidazole). Factors that might interfere with standard single-dose treatment for trichomoniasis in these women include high rates of asymptomatic BV co-infections, use of antiretroviral therapy, changes in vaginal ecology, and impaired immunity (656,720,721).

### Treatment

Treatment reduces symptoms and signs of *T. vaginalis* infection and might reduce transmission. Likelihood of adverse outcomes in women with HIV is also reduced with *T. vaginalis* therapy.

#### *Recommended Regimen for Women with HIV Infection*

**Metronidazole** 500 mg orally twice daily for 7 days

In women with HIV infection who receive a diagnosis of *T. vaginalis* infection, retesting is recommended within 3 months following initial treatment; NAAT is encouraged because of higher sensitivity of these tests. Data are insufficient to recommend routine screening, alternative treatment regimens of longer duration, or retesting in men.

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