



**PathAdvantage™**

# **THE BUG BOOK**

**Compiled by:  
PathAdvantage Physicians**

**8th Edition**

# INTRODUCTION

Welcome to the 8<sup>th</sup> edition of the PathAdvantage Bug Book, your trusted resource for up-to-date anti-infective guidance in treating STIs and women's health conditions.

This year's edition reflects the continuous evolution of the field, particularly in the fight against antibiotic resistance. As a significant addition, we've included a new chapter dedicated to Antibiotic Resistant (ABR) gene testing. This chapter will equip you with the latest knowledge on identifying patients who may benefit from alternative therapies due to the presence of resistance genes.

As always, our mission remains the same: to provide clinicians who utilize PathAdvantage's laboratory services with the most current references and treatment information for infectious agents.

The "Bug Book" continues its commitment to timeliness and accuracy. We've meticulously reviewed all topics since the 2022 edition, with a particular focus on newly released 2024 STI treatment guidelines. This ensures you have access to the most up-to-date, evidence-based antibiotic regimens for optimal patient care.

Related to the new chapter on ABR testing, you'll also find significant revision to the treatment of *Mycoplasma genitalium*, which covers the CDC recommendation of recommended ABR gene testing on all positive specimens. We have also included new treatment options for urinary tract infections.

Please note that the complete list of references is not included in this edition; however, all references are available upon request.

We at PathAdvantage value our partnership with you in delivering the best possible care for your patients.

Sincerely,

Alexandra Gillespie, MD, Medical Director  
and the PathAdvantage Team

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**Our proprietary reference**

**The Bug Book includes 60+ additional pages,  
is a comprehensive, up-to-date resource on detected  
infectious agents and related treatment.**

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# BACTERIAL VAGINOSIS OVERVIEW

## Pathogenesis And Microbiology:

The healthy vaginal microbiome is both a complex, dynamic ecosystem and is predominantly made up of a variety of *Lactobacillus* spp (comprising **90–95%** of total bacteria). The most common *Lactobacillus* spp include *L. crispatus*, *L. iners*, *L. jensenii*, and *L. gasseri*. These produce various metabolites such as lactic acid, bacteriocins and hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>), which results in a vaginal pH  $\leq$  4.5 (normal range being 3.8–4.4). This creates an unfavorable environment for pathogenic microorganisms such as *Gardnerella vaginalis*, *Atopobium vaginae*, *Prevotella* species, *Bacteroides* species, *Mycoplasma hominis*, *Ureaplasma urealyticum*, and *Mobiluncus* species. Similarly, disruption of this protective environment leads to a dysbiotic state, and overgrowth of these facultatively pathogenic organisms.

*Lactobacillus* clearly has an important, protective role in the prevention of BV. Recently, in addition to the most common 4 types of *Lactobacillus* species, PathAdvantage has recently added testing for *L. reuteri* and *L. rhamnosus*, both of which are very important *Lactobacillus* species found in over-the-counter probiotic supplements. The information we provide, in reporting *lactobacillus* proportions on laboratory reports, is intended to be adjunctive and used as a tool to help counsel patients and/or monitor response to treatment. This information should not be considered diagnostic in and of itself. As always, correlation with clinical presentation is highly recommended.

## Risk Factors:

Risk factors associated with BV include, but are not limited to, hormonal changes, medications (such as antibiotics, immunosuppressants), foreign bodies, excessive personal hygiene (douching), number and frequency of sexual contacts, smoking, infection with human immunodeficiency virus (HIV), low socioeconomic status, and sex with uncircumcised men. The prevalence of BV varies greatly depending on geographical location, the highest being in parts of Africa (up to 58%) and lowest in Asia, Australia, and Western Europe (< 10%). However, there are significant differences within the geographical regions and ethnic groups themselves.

## Clinical Features:

Approximately 50% of women with BV are symptomatic and report uncomfortable vaginal malodor, discharge, and itching. Approximately 50% of women with BV are therefore *asymptomatic*. These women may NOT actually have a 'dysbiotic state' and instead, have a microbiome made up of non-*Lactobacillus* dominant flora which demonstrate lower proportions of lactic acid bacteria and higher proportions of strictly anaerobic organisms, including *Prevotella*, *Atopobium*, *Gardnerella*, *Megasphaera*, *Eggerthella*, *Aerococcus*, and *Mobiluncus*. Women with this non-*lactobacillus* dominant flora have a higher median pH ( $5.3 \pm 0.6$ ), however, this is common and is seen in healthy, asymptomatic black and Hispanic women. **Therefore, these normal group of women may be misdiagnosed with BV, since lactobacilli are not the dominant flora, and the pH is above 4.5.**



# BACTERIAL VAGINOSIS OVERVIEW

Women with BV are at an increased risk of pelvic inflammatory disease (PID), are at higher risk of both acquiring and transmitting HIV and may even be at higher risk for cervical cancer/dysplasia. BV may also facilitate the transmission of other sexually transmitted infections such as *Chlamydia trachomatis*, *Trichomonas vaginalis*, *Neisseria gonorrhoeae* and herpes simplex virus type 2 (HSV-2).

BV is associated with reproductive and obstetric complications, like increased risk of acquiring pelvic inflammatory disease, or having spontaneous abortion, preterm delivery, low birth weight newborns, and postpartum endometritis.

As mentioned, BV may be a factor in development of precancerous cervical lesions. In a systematic review and meta-analysis of primarily cross-sectional studies, the risk of cervical intraepithelial neoplasia (CIN) or squamous intraepithelial lesions (SIL) was increased in women with BV; however, there was considerable heterogeneity among these studies and both CIN 1 and low-grade SIL, which do not usually progress to cancer, were included as outcomes. BV appears conducive to the persistence of human papillomavirus (HPV) infection which is necessary but not sufficient for development of high-grade cervical lesions and cancer.

## BV Treatment Overview:

Figure 1. Treatment options for BV. The goal of treatment is to restore the normal vaginal flora and reduce symptoms. The mainstay of treatment is the use of antibiotics. Treatment options include oral antibiotics, topical antibiotics, and probiotics. The goal of treatment is to restore the normal vaginal flora and reduce symptoms. The mainstay of treatment is the use of antibiotics. Treatment options include oral antibiotics, topical antibiotics, and probiotics.

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Orally administered antibiotics have been the mainstay of antibiotic therapy for BV. However, a 2017 Cochrane review found that topical antibiotics (metronidazole gel) were not superior to oral antibiotics for the treatment of bacterial vaginosis in adult women. Metronidazole has been used for decades to treat BV and has been found to be effective in restoring the normal vaginal flora. A single dose treatment (metronidazole 500 mg)

# BACTERIAL VAGINOSIS OVERVIEW

metronidazole administered with a longer half-life than metronidazole. Single-dose therapy with metronidazole has been shown to be equivalent to a 7-day course of metronidazole.

Sexual<sup>†</sup> partners should be treated with metronidazole, either as oral therapy and consumed within 30 minutes without chewing or crushing. It is not intended to be effective in any other use.

The most frequently reported adverse effect of tinidazole<sup>†</sup> was gastrointestinal conditions in 5.0% of women.

## RECOMMENDED ANTIBIOTIC REGIMENS:

- **Metronidazole** 1g orally single dose<sup>†</sup>
- **Metronidazole** 500 mg orally twice a day for 7 days<sup>†</sup> **OR**
- **Metronidazole gel** 0.75% (one half applicator 0.5 g intravaginally once a day for 5 days) **OR**
- **Clindamycin cream** 2% (one half applicator 0.5 g intravaginally at bedtime for 7 days)<sup>\*\*</sup>

<sup>†</sup>Consuming alcohol should be avoided during treatment and for 72 hours thereafter.  
<sup>\*\*</sup>Clindamycin cream is not tested and might interact with condoms and diaphragms for 7 days after use due to clindamycin product staining for additional observations.

## ALTERNATIVE ANTIBIOTIC REGIMENS:

- **Tinidazole** 1g orally once daily for 2 days **OR**
- **Tinidazole** 1g orally once daily for 3 days **OR**
- **Clindamycin** 300 mg orally twice daily for 7 days **OR**
- **Clindamycin cream** 2% (one half applicator 0.5 g intravaginally once at bedtime for 7 days)

Tinidazole has a longer half-life and generally is associated with less adverse effects than metronidazole. However, metronidazole remains the first-line treatment in part because of the risk of local-to-local efficacy studies between metronidazole and tinidazole. Tinidazole can be considered in recurrent cases of BV that have not responded to other treatment regimens.

## Allergy or Intolerance to the Recommended Therapy

Alternative treatment regimens are preferred in case of allergy or intolerance to metronidazole or tinidazole. Alternative metronidazole gel can be considered for women





# BACTERIAL VAGINOSIS OVERVIEW

Use do not include systemic antimicrobials. Antiprotozoal antimicrobials should not be administered to women along with antimicrobials.

## BV in Pregnancy

There is a strong association between BV during pregnancy and all major adverse pregnancy outcomes. Unfortunately, treatment of BV during pregnancy has been highly variable and a predictor of these adverse outcomes.

Despite the inconsistent study results about women who do exhibit treated for symptoms of any BV during pregnancy, regardless of the antimicrobial agent used to treat pregnant women, our therapy is preferred because of the possibility of additional upper genital tract infection.

The CDC's 2015 guideline recommends treatment for all symptomatic pregnant women.

## RECOMMENDED REGIMENS FOR PREGNANT WOMEN:

- **Metronidazole** 500 mg orally twice a day for 7 days **OR**
- **Metronidazole** 750 mg orally three times a day for 7 days **OR**
- **Clindamycin** 300 mg orally twice a day for 7 days

## Recurrent BV

The recurrence rate for BV is 20-40% one month after therapy. Recurrence may be a result of the persistence of the associated organisms and a failure of antibodies to respond.

Two weekly metronidazole gel for 4-6 months may reduce recurrences.

## Treatment of sexual partners

**Male partners:** It is not necessary to treat male sexual partners of affected women, as there is no strong evidence that the woman's response to therapy and rate of relapse are influenced by treatment of her male sex partner(s). However, the available male gel (brand, well designed and large trials should be performed to assess the efficacy of male partner treatment.

**Female partners:** Sexual intercourse appears to play a role in disease activity. Some studies have reported elevated rates of recurrence when male sexual partners used condoms routinely during either or after women received treatment.

**Female partners:** Women with BV who have sex with women (MSM) should advise their partners to be aware of the signs and symptoms of BV given the high rate of recurrent infection (25 to 50 percent); in women with confirmed infection, treatment is indicated for onset of symptoms.





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