



Cytolytic Vaginosis: Diagnostic Challenges and Therapeutic Approaches

Maria Clara Silva Bovi ¹, Nathan Castro Silva ¹, Lourenia Caroline Fernandes Veiga ¹, Anna Carolina Souto Perez ¹, Renata Cicci Cunha Castro ¹, Flavia Ana Pacheco ¹, Ruchele Dias Nogueira ¹.



<https://doi.org/10.36557/2674-8169.2025v7n8p1493-1508>

Artigo recebido em 21 de Julho e publicado em 31 de Agosto de 2025

REVISION

ABSTRACT

Objective: This study aims to provide a comprehensive review of cytolytic vaginosis (CV), a condition often overlooked in clinical practice, to improve understanding of its pathophysiology, diagnostic challenges, and effective management strategies.

Methods: An integrative literature review was conducted using publications from the last 34 years. Searches were performed in the Google Scholar, Scopus, and Web of Science databases, focusing on articles in English and Portuguese that addressed cytolytic vaginosis, the vaginal microbiome, *Lactobacillus* species, and therapeutic approaches.

Results: Cytolytic vaginosis is a form of vaginal dysbiosis characterized by an overgrowth of *Lactobacillus* species, leading to an abnormally low vaginal pH. This hyper-acidity causes the lysis of vaginal epithelial cells, resulting in symptoms such as itching, burning, and a thick, white, clumpy discharge. CV symptoms are cyclical, often worsening in the premenstrual phase, which helps differentiate it from vulvovaginal candidiasis (VVC). Diagnosis is primarily based on microscopic examination of vaginal fluid, revealing an abundance of pleomorphic lactobacilli, epithelial cell fragments, and a low pH (<4.5), while excluding common pathogens like *Candida* and *Gardnerella*. The main treatment involves alkalizing the vaginal environment with sodium bicarbonate to reduce the *Lactobacillus* population and restore microbial balance.

Conclusion: Cytolytic vaginosis is a significant, yet frequently misdiagnosed, cause of vulvovaginitis in reproductive-aged women. Increased clinical awareness and proper use of microscopic diagnostic tools are essential for accurate identification. Effective management with simple alkalizing agents offers symptomatic relief and prevents the inappropriate use of antibiotics and antifungals. This review highlights the need for continued education and research to improve diagnostic protocols and develop more targeted treatments for this condition.

Keywords: Cytolytic Vaginosis; Vaginal Microbiota; Differential Diagnosis

Vaginose Citolítica: Desafios Diagnósticos e Abordagens Terapêuticas

RESUMO

Objetivo: Este estudo tem como objetivo fornecer uma revisão abrangente sobre a vaginose citolítica (VC), uma condição frequentemente negligenciada na prática clínica, a fim de melhorar a compreensão de sua fisiopatologia, desafios diagnósticos e estratégias eficazes de manejo.

Métodos: Foi realizada uma revisão integrativa da literatura utilizando publicações dos últimos 34 anos. As buscas foram feitas nas bases de dados Google Scholar, Scopus e Web of Science, com foco em artigos em inglês e português que abordassem a vaginose citolítica, o microbioma vaginal, espécies de *Lactobacillus* e abordagens terapêuticas.

Resultados: A vaginose citolítica é uma forma de disbiose vaginal caracterizada por crescimento excessivo de espécies de *Lactobacillus*, levando a um pH vaginal anormalmente baixo. Essa hiperacidez causa lise das células epiteliais vaginais, resultando em sintomas como prurido, ardência e corrimento espesso, branco e grumoso. Os sintomas da VC são cíclicos, frequentemente piorando na fase pré-menstrual, o que auxilia na diferenciação em relação à candidíase vulvovaginal (CVV). O diagnóstico baseia-se principalmente no exame microscópico do fluido vaginal, que revela abundância de lactobacilos pleomórficos, fragmentos de células epiteliais e baixo pH (<4,5), ao mesmo tempo em que exclui patógenos comuns como *Candida* e *Gardnerella*. O principal tratamento envolve alcalinizar o ambiente vaginal com bicarbonato de sódio para reduzir a população de *Lactobacillus* e restaurar o equilíbrio microbiano.

Conclusão: A vaginose citolítica é uma causa significativa, porém frequentemente mal diagnosticada, de vulvovaginites em mulheres em idade reprodutiva. Maior conscientização clínica e o uso adequado de ferramentas diagnósticas microscópicas são essenciais para sua identificação correta. O manejo eficaz com agentes alcalinizantes simples proporciona alívio sintomático e evita o uso inadequado de antibióticos e antifúngicos. Esta revisão destaca a necessidade de educação e pesquisa contínuas para aprimorar os protocolos diagnósticos e desenvolver tratamentos mais direcionados para essa condição.

Palavras chave: Vaginose Citolítica; Microbiota Vaginal; Diagnóstico Diferencial.

Instituição afiliada – Universidade de Uberaba (UNIUBE) ¹

Autor correspondente: Nathan Castro Silva nathancastrasilva@gmail.com

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INTRODUCTION

The vaginal microbiota plays a crucial role in maintaining gynecological health. In most healthy reproductive-aged women, the vaginal ecosystem is dominated by *Lactobacillus* species, particularly *L. crispatus*, which produce lactic acid to maintain a low vaginal pH (Lev-Sagie *et al.*, 2022; Xu *et al.*, 2019). This acidic environment is a primary defense mechanism against the colonization of pathogenic bacteria and fungi (Kraut *et al.*, 2023). However, an overabundance of these beneficial bacteria can lead to a state of dysbiosis known as Cytolytic Vaginosis (CV) (Cibley & Cibley, 1991; Lev-Sagie *et al.*, 2022). First described by Cibley and Cibley in 1991, CV is characterized by the lysis of host epithelial cells due to an overly acidic environment, resulting in symptoms of vulvovaginitis (Cibley & Cibley, 1991).

The complex interplay of factors influencing the vaginal microbiota, including hormonal fluctuations, sexual activity, and antibiotic use, underscores the delicate balance required for a healthy ecosystem. When this balance is disrupted, pathogenic microorganisms can proliferate, leading to conditions like bacterial vaginosis (BV) and vulvovaginal candidiasis (VVC). However, in the case of CV, the pathology arises not from a foreign invader but from the overactivity of the resident, protective flora itself (Kraut *et al.*, 2023; Yang *et al.*, 2020). This internal dysbiosis is a key reason why CV is often overlooked, as it challenges the traditional paradigm of infectious vaginitis, where a specific pathogen is the target of treatment. Consequently, patients with CV may be repeatedly and inappropriately treated with antimicrobial or antifungal agents, leading to prolonged suffering and increased healthcare costs.

The clinical presentation of CV is notoriously confusing. Patients typically report intense symptoms such as vulvovaginal itching, burning, and a copious white discharge, which are hallmark signs of VVC (Hu *et al.*, 2015; Hacısalıhoğlu & Acet, 2021). The discharge in CV can be thick and clumpy, further reinforcing a misdiagnosis of a yeast infection (Hacısalıhoğlu & Acet, 2021). This similarity is so striking that even experienced clinicians may find it difficult to differentiate CV from other causes of vaginitis based on symptoms alone (Cerikcioglu & Beksac, 2004). A key diagnostic clue, however, lies in the cyclical nature of the symptoms: they often worsen in the premenstrual phase, when



elevated estrogen levels promote a glycogen-rich environment for *Lactobacillus* to thrive, and temporarily improve during menstruation due to the neutralizing effect of menstrual blood (Cibley & Cibley, 1991; Yang et al., 2017). Recognizing this pattern is essential for guiding the diagnostic process away from the most common diagnoses and toward more specific testing.

Despite its recognition in the scientific literature, CV remains an underdiagnosed condition, often mistaken for more common infections like bacterial vaginosis or vulvovaginal candidiasis (Hu et al., 2015; Hacısalıhoğlu & Acet, 2021; Cerikcioglu & Beksac, 2004). This misdiagnosis is a significant clinical problem, as it can lead to ineffective and recurrent treatments, prolonged patient discomfort, and a negative impact on quality of life (Kraut et al., 2023; Hacısalıhoğlu & Acet, 2021; Hutti & Hoffman, 2000). The difficulty is compounded by the fact that many healthcare settings lack the resources or expertise for proper microscopic examination of vaginal smears, which is the cornerstone of a correct diagnosis (Sanches et al., 2020).

This paper aims to consolidate current knowledge on CV, highlighting the diagnostic challenges and discussing therapeutic strategies and emerging areas of research to better inform clinical practice and improve patient care.

METHODOLOGY

This study was an integrative review conducted in the Google Scholar, Scopus, and Web of Science databases. Publications from the last 34 years were selected. Articles addressing cytolytic vaginosis, vaginal microbiota, lactobacilli, and potential treatments were included.

RESULTS AND DISCUSSION

The extensive literature on cytolytic vaginosis consistently highlights its unique and paradoxical nature as a form of vaginal dysbiosis. Unlike other common vulvovaginitides, CV arises not from a foreign pathogen but from a pathological overgrowth of the very organisms responsible for maintaining a healthy vaginal environment: *Lactobacillus* species. A comprehensive review of the available literature



reveals a consensus on its core pathophysiology, distinct diagnostic features, and effective management strategies, while also underscoring the urgent need for increased clinical awareness to combat frequent misdiagnosis. In a healthy vaginal ecosystem, *Lactobacillus* is the predominant genus, actively protecting the host from pathogens. Its primary defense mechanism involves the metabolic conversion of glycogen, a process fueled by estrogen, into lactic acid. This maintains a low vaginal pH, typically between 3.8 and 4.5, which creates an environment inhospitable to most pathogens, including those associated with bacterial vaginosis (BV) and trichomoniasis (Lev-Sagie et al., 2022; Brolazo et al., 2009). Beyond lactic acid, specific strains of lactobacilli also produce hydrogen peroxide (H₂O₂) and bacteriocins, further reinforcing the local immune defenses and competing with other microorganisms for nutrients (Soares et al., 2017). They inhibit the adherence of fungi to the vaginal epithelial cells and compete for nutrients (Soares et al., 2017). Studies have shown that probiotic supplementation with *Lactobacillus* can help women prevent and treat vaginal infections, offering a treatment option with fewer side effects compared to traditional medications (Silva et al., 2024). This antagonistic action of *Lactobacillus* represents a crucial defense against various infections, most notably bacterial vaginosis, which is characterized by the excessive proliferation of *Gardnerella vaginalis* and is the most common form of vulvovaginitis in women of reproductive age. In addition to its impact on gynecological health, BV is associated with more serious outcomes, such as preterm birth and increased susceptibility to HIV infection and transmission (Brolazo et al., 2009).

In CV, this protective system becomes the source of pathology. As first described by Cibley and Cibley in 1991, the condition is characterized by a dramatic overabundance of *Lactobacillus*, which drives the vaginal pH to an even lower, hyper-acidic state, often below 4.2. A study using high-throughput sequencing confirmed this overgrowth, identifying *Lactobacillus crispatus* and *L. gasseri* as the predominant species in women with CV (Xu et al., 2019; Yang et al., 2020). This extreme acidity leads to the direct lysis, or destruction, of the host's intermediate squamous epithelial cells. The mechanism of this cellular destruction may not be solely due to hyperacidity. Research on the cytolytic activity of vaginolysin, a toxin produced by some *Lactobacillus* species, suggests it can directly cause cell death, a process strictly dependent on cholesterol (Zilnyte et al., 2015). This finding provides a more comprehensive explanation for the epithelial cell

damage seen in CV. This mechanism fundamentally differs from the pathology of vulvovaginal candidiasis (VVC), where the fungal toxin candidalysin targets specific host cell receptors, triggering inflammation and cell death, a process distinct from acid-induced lysis (Lin et al., 2024).

This clinical exam, however, presents a significant diagnostic challenge due to its marked clinical mimicry of VVC. Patients report hallmark symptoms of vulvovaginal itching, burning, and a copious, thick, white, or yellowish-white discharge (Hu et al., 2015; Hacısalihoğlu & Acet, 2021). This striking similarity often leads to repeated and inappropriate treatments, as highlighted by case reports and reviews (Cerikcioglu & Beksac, 2004; Komec & Aydin, 2025). The difficulty is compounded by the fact that many healthcare providers lack the necessary training or resources for proper microscopic analysis, which is the cornerstone of an accurate diagnosis (Sanches et al., 2020). The clinical is also often confused with vulvovaginal candidiasis due to the similarity of symptoms. Patients commonly report itching and irritation in the genital area, accompanied by a whitish or yellowish-white discharge, often in clumps. This discharge tends to follow a cyclical pattern, which can be an important differential indicator in clinical practice. Examination reveals a milky, clumpy vaginal discharge adhering to the vaginal walls. The vaginal pH is typically below 4.5, and the amine test is usually negative, which helps rule out bacterial vaginosis (Fredericks et al., 2018; Carvalho, 2021). Conversely, in mixed vaginitis, the clinical presentation can vary widely depending on the microorganisms involved. When bacterial vaginosis and candidiasis coexist, symptoms may include both the foul-smelling discharge characteristic of BV and the intense itching typical of candidiasis, making diagnosis more complex (Fredericks et al., 2018; Carvalho, 2021).

However, a crucial clinical clue that distinguishes CV from other vaginitis is its cyclical nature. The symptoms typically intensify during the premenstrual or luteal phase, when elevated estrogen levels provide a rich glycogen source for lactobacilli, and then spontaneously improve or resolve during menstruation as the menstrual blood temporarily neutralizes the vaginal pH (Cibley & Cibley, 1991; Secor, 1992; Yang et al., 2017). This cyclical pattern is a vital differential indicator that should guide clinicians to consider CV as a diagnosis, a key point emphasized by Hutti and Hoffman (2000), who called it an "overlooked cause" of such symptoms. The misdiagnosis not only prolongs

patient discomfort but can also contribute to the rising issue of antimicrobial resistance by promoting the overuse of unnecessary medications (Menz et al., 2020).

A definitive diagnosis relies on a meticulous microscopic examination of vaginal fluid. The literature provides clear guidance on the specific laboratory findings that are considered diagnostic criteria for CV (Sanches et al., 2020). These include: an abundance of pleomorphic lactobacilli and the presence of "naked nuclei" and cellular fragments, which are remnants of lysed epithelial cells (Demirezen, 2003; Hills, 2007). The vaginal pH is consistently below 4.5, which immediately helps rule out BV, a condition characterized by a pH above 4.5 and a positive amine test (Fredericks et al., 2002). It is crucial to definitively rule out other infections. A potassium hydroxide (KOH) preparation and culture on Sabouraud Dextrose Agar should be performed to exclude *Candida* infection (Russo, 2023). The absence of clue cells, *Trichomonas* species, or other pathogens is also a key diagnostic factor. Correct diagnosis is essential for guiding medical management and accelerating patient recovery. Symptoms to be evaluated include itching, burning, and dysuria, especially during the luteal and premenstrual phases. Physical examination reveals an increase in vaginal discharge, characterized by a fluid, clumpy, or flocculent appearance, with or without signs of inflammation (Silva et al., 2023). In the laboratory setting, a vaginal smear is one of the main tests used as it allows for the identification of characteristic patterns of cytolytic vaginosis (Soares et al., 2017). Key findings include numerous pleomorphic lactobacilli and cytolysis, with the presence of fragments of lysed cell cytoplasm and free nuclei, which can be mistaken for red blood cells. The lactobacilli may also be adhered to cell fragments, potentially leading to confusion with clue cells found in bacterial vaginosis. A low presence of leukocytes is also noted, and the vaginal pH is typically below 4.2 in cases of cytolytic vaginosis (Sanches, 2018; Soares et al., 2017). Excluding a *Candida albicans* infection is crucial for differential diagnosis. To correctly exclude this microorganism, a direct examination should be performed, along with 10% potassium hydroxide (KOH) preparations to detect fungal structures. Culture of the secretion on Sabouraud Dextrose Agar should also be done, where no growth is expected (Russo, 2023).

Beyond the clinical and microscopic findings, a deeper understanding of the predisposing factors is essential for both management and prevention. The etiology of CV is not fully understood, but several contributing factors have been identified (Soares

et al., 2017). The condition is strongly linked to hormonal fluctuations during the reproductive years. Elevated estrogen levels, as seen in pregnancy or the premenstrual phase, lead to increased glycogen deposition in vaginal epithelial cells, providing a rich substrate that fuels the over-proliferation of lactobacilli (Neves et al., 2019). Systemic conditions, such as diabetes mellitus, can also act as predisposing factors by providing a greater availability of glucose, which further promotes *Lactobacillus* growth and subsequent cytolysis (Kraut et al., 2023). The administration of antibiotics can also promote the dissemination of specific bacilli. A study that evaluated 21 women diagnosed with bacterial vaginosis showed that the use of antimicrobials, especially metronidazole, resulted in a reduction in the heterogeneity of the vaginal microbiota. This alteration favored the predominant colonization by *Lactobacillus crispatus*, a species associated, in certain circumstances, with the development of cytolytic vaginosis due to its high production of lactic acid and hydrogen peroxide, which contributes to epithelial cell lysis (Souza, 2019; Zwittink et al., 2021). Furthermore, research by Giraldo et al. (2005) found an inverse relationship between the frequency of vaginal intercourse and the occurrence of CV, suggesting that less sexual activity may be a predisposing factor for the condition.

The primary goal of CV treatment is to alleviate symptoms by reducing the excessive *Lactobacillus* population and raising the vaginal pH to a more physiological level (Suresh et al., 2009; Pereira & Vale, 2024). The standard and most effective therapeutic approach is the use of alkalizing agents, most commonly sodium bicarbonate, administered as vaginal douches or sitz baths. These solutions directly neutralize the acidic environment, providing rapid symptomatic relief.

The literature has also highlighted the development of more convenient formulations, such as sodium bicarbonate-based gels, which could improve patient adherence and offer a more targeted treatment (Gaspar et al., 2024). The broader implications of misdiagnosing CV extend beyond patient discomfort. The indiscriminate use of antibiotics and antifungals, a common consequence of misdiagnosis, contributes to the growing issue of antimicrobial resistance (Menz et al., 2020). Accurate diagnosis of CV is therefore not only crucial for patient care but also for promoting a more responsible approach to antibiotic stewardship. The literature emphasizes that prevention involves more than just a correct diagnosis; promoting general awareness of



women's health, combined with habits like a balanced diet, wearing appropriate underwear, and maintaining correct hygiene practices, plays a fundamental role in preserving the balance of the vaginal microbiota. These measures help reduce the risk of dysbiotic changes and, consequently, prevent various gynecological health issues (Santana et al., 2025). Novel diagnostic approaches are also being explored. A pilot study using vaginal lipidomics showed distinct lipid profiles in women with CV compared to those with VVC, suggesting a potential new method for differential diagnosis in the future (Sanches et al., 2018).

CONCLUSION

Cytolytic vaginosis represents a crucial, yet frequently overlooked, cause of chronic vulvovaginitis in reproductive-aged women. Its clinical mimicry of more common conditions like VVC and BV leads to diagnostic delays and ineffective treatments, impacting patient quality of life. The pathophysiology is rooted in a dysbiosis characterized by an overgrowth of *Lactobacillus* and an abnormally low vaginal pH, a process closely linked to hormonal fluctuations and other predisposing factors.

The definitive diagnosis of CV relies on a combination of clinical symptoms and specific microscopic findings, particularly the presence of pleomorphic *Lactobacillus* and cellular cytolysis in an acidic environment. Therapeutic management, centered on vaginal alkalization with sodium bicarbonate, is straightforward and effective when correctly applied. However, a significant gap remains in clinical practice due to a lack of widespread awareness and standardized diagnostic protocols.

Future efforts should focus on increasing educational initiatives for healthcare providers to improve recognition of this condition. Further research into the specific mechanisms of *Lactobacillus* overgrowth and the development of targeted, patient-friendly treatments, such as novel alkalizing gels, are essential. By enhancing both clinical knowledge and therapeutic options, we can better address this condition, ensure accurate diagnoses, and provide effective relief for affected patients.

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