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Vaginal Microbiome in Health and Disease: Dysbiosis and Microbiome-Based Therapies

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Abstract

Background: The vaginal microbiome represents a specialized microbial ecosystem essential for maintaining female reproductive health. Lactobacillus-dominated communities play a key role in preserving vaginal acidity, preventing pathogen colonization, and supporting mucosal immune balance. Disruption of this equilibrium leads to vaginal dysbiosis associated with multiple gynecological and reproductive disorders.

Aims: This review aims to synthesize recent evidence on vaginal microbiome composition, determinants of microbial stability, dysbiosis-associated conditions, diagnostic advances, and emerging microbiome-based therapeutic strategies.

Study Design: Narrative literature review.

Methods: A literature search was conducted using peer-reviewed publications from 2020–2025 retrieved from international databases including PubMed, Scopus, and Web of Science. Studies addressing vaginal microbiome composition, dysbiosis mechanisms, diagnostic approaches, and microbiome-directed therapies were included. Evidence from clinical trials, cohort studies, and reviews was analyzed through narrative synthesis.

Results: Recent molecular and metagenomic studies demonstrate that Lactobacillus-dominated vaginal ecosystems are strongly associated with microbial stability and protection against infections such as bacterial vaginosis,

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aerobic vaginitis, vulvovaginal candidiasis, Human papilomavirus (HPV) infection, and Human Immunodeficiency Virus (HIV) acquisition. Advances in sequencing technologies and microbiome-targeted therapies, including probiotics and vaginal microbiota transplantation, provide promising opportunities for long-term restoration of vaginal ecosystem balance.

Conclusion: Understanding vaginal microbiome dynamics supports a shift from pathogen-centered management toward ecosystem-based therapeutic strategies. Microbiome-informed diagnostics and interventions may improve prevention, recurrence control, and reproductive health outcomes.

Keywords: microbiome, vaginal dysbiosis, bacterial vaginosis, Lactobacilus, reproductive health.