

Vaginal Microbiota Transplantation (VMT): A Truly Opulent and Promising Edge (Frontiers in Cellular and Infection Microbiology, 2024)

- The article reviews the emerging use of Vaginal Microbiota Transplantation (VMT), a novel therapy that transfers vaginal microbiota from a healthy donor to a recipient in order to restore a normal vaginal microbial environment.
- The rationale behind VMT is based on the importance of the vaginal microbiome, which in healthy women is predominantly composed of *Lactobacillus* species. These bacteria maintain an acidic vaginal pH, inhibit growth of pathogenic organisms, and support local immune defenses.
- Vaginal dysbiosis, characterized by a loss of *Lactobacillus* dominance and overgrowth of anaerobic bacteria, has been associated with numerous gynecologic and obstetric conditions including bacterial vaginosis (BV), recurrent vulvovaginal infections, sexually transmitted infections, infertility, pregnancy complications, and gynecologic malignancies.
- Current treatments for bacterial vaginosis primarily rely on antibiotics such as metronidazole and clindamycin. Although these therapies may temporarily improve symptoms, recurrence rates remain high because antibiotics often fail to restore the normal vaginal microbiome.
- VMT aims to address the underlying cause of recurrent disease by re-establishing a healthy microbial ecosystem rather than simply eliminating pathogenic organisms.
- The article highlights the landmark study by Lev-Sagie et al. (Nature Medicine, 2019) involving five women with severe recurrent bacterial vaginosis who had failed standard therapies. Following antibiotic pretreatment and VMT, four of the five participants achieved long-term remission, with some remaining symptom-free for up to 21 months. No serious adverse events were reported.
- These findings provided the first proof-of-concept evidence that VMT may be an effective treatment for recurrent BV and demonstrated the feasibility of modifying the vaginal microbiome therapeutically.
- Researchers are also investigating synthetic vaginal microbial communities composed of beneficial *Lactobacillus* species as an alternative to donor-derived transplantation. These synthetic preparations may reduce concerns regarding donor variability, infectious disease transmission, and standardization of treatment.
- Beyond recurrent BV, the review explores potential applications of VMT in reproductive medicine. The vaginal microbiome may influence endometrial health, implantation, fertility, and reproductive outcomes through interactions with the upper reproductive tract.
- Experimental animal studies suggest that restoration of healthy vaginal microbiota may reduce inflammation associated with endometriosis. In mouse models, VMT decreased

inflammatory cytokines such as IL-1 β , IL-6, and TNF- α and slowed progression of endometriotic lesions.

- The article discusses the concept of neonatal microbial restoration, in which infants born via cesarean delivery are exposed to maternal vaginal microbiota shortly after birth. This approach aims to recreate microbial exposure that normally occurs during vaginal delivery and potentially reduce long-term risks associated with altered microbiome development. However, current evidence remains inconsistent.
- Emerging evidence suggests that vaginal microbiota may also play a role in gynecologic cancers. Vaginal dysbiosis has been associated with persistent HPV infection, cervical dysplasia, cervical cancer, endometrial cancer, and ovarian cancer. Researchers hypothesize that restoration of a healthy *Lactobacillus*-dominant environment may improve immune function and reduce disease progression, although clinical evidence remains limited.
- The authors emphasize that VMT represents a promising new therapeutic strategy that may eventually extend beyond infectious conditions to include infertility, endometriosis, pregnancy complications, and gynecologic oncology.
- Despite encouraging early results, the evidence base remains limited. Most studies involve small sample sizes, animal models, or observational data. Large randomized controlled trials are still lacking.
- Important challenges include development of standardized donor screening protocols, ensuring long-term safety, preventing transmission of infectious agents, and establishing regulatory guidelines for clinical use.
- The authors conclude that VMT has significant potential to transform management of recurrent bacterial vaginosis and other gynecologic conditions by targeting the vaginal microbiome directly. However, additional high-quality human studies are required before VMT can become a routine part of clinical practice.

Citation

Meng Y, Sun J, Zhang G. Vaginal microbiota transplantation is a truly opulent and promising edge: fully grasp its potential. *Front Cell Infect Microbiol.* 2024;14:1280636. Published 2024 Mar 22. doi:10.3389/fcimb.2024.1280636

Lev-Sagie, A., Goldman-Wohl, D., Cohen, Y., Dori-Bachash, M., Leshem, A., Mor, U., et al. (2019). Vaginal microbiome transplantation in women with intractable bacterial vaginosis. *Nat. Med.* 25, 1500–1504. doi: 10.1038/s41591-019-0600-6