

The Vaginal Microbiome

Lactobacillus dominance, community state types, and clinical implications

KEY CONCEPTS

- Five community state types (CSTs): CST-I (*L. crispatus*, most protective), II (*L. gasseri*), III (*L. iners*, ambiguous), V (*L. jensenii*), IV (diverse anaerobes, BV-associated).
- *L. crispatus* produces both D- and L-lactic acid; D-lactic acid has stronger HIV virucidal activity. *L. iners* produces primarily L-lactic acid and may facilitate transition to dysbiosis.
- Bacterial vaginosis is a polymicrobial dysbiosis. *Gardnerella* biofilm persistence drives ~50% recurrence within 12 months after standard antibiotics.
- BV increases HIV acquisition risk ~60% via mucosal barrier disruption and immune cell recruitment.
- CST-IV prevalence varies by ethnicity — more common in Black and Hispanic women. Asymptomatic CST-IV may be a normal variant.

EVIDENCE-GRADED CLAIMS

A *L. crispatus* dominance is protective against BV and STIs

Consistently replicated across cohorts and meta-analyses

A BV increases HIV acquisition risk ~60%

Large prospective cohorts; mucosal barrier disruption mechanism

D Vaginal microbiome transplant (VMT) can treat recurrent BV

Case reports and small pilots only; no RCTs as of 2025

E Probiotic supplements restore vaginal *Lactobacillus*

Oral probiotics rarely colonize the vagina; mixed results

CTMR / ENGSTRAND — KAROLINSKA RESEARCH HIGHLIGHTS

- Norenthag 2020: *L. crispatus* linked to lower HPV prevalence in vaccinated Swedish women.
- Cheng 2021: miRNA panel predicts vaginal CST — potential PCR-based screening.
- VaMiGyn 2025: Cohort of 4,043 women defining population-level vaginal microbiome variation.
- Fransson 2024: Three samples classify long-term microbiome patterns.
- Norenthag 2023: Strain-level *L. crispatus* diversity predicts preterm birth risk.
- Norenthag 2024: Pre-transfer microbiome composition influences IVF implantation.

CLINICAL TAKEAWAYS

- A 'healthy' vaginal microbiome is *Lactobacillus*-dominant — but not all species are equally protective.
- BV recurs because the *Gardnerella* biofilm persists — antibiotics suppress but rarely eradicate.
- Douching disrupts protective communities; every major gynecological society advises against it.
- Vaginal microbiome screening may complement HPV testing, fertility workup, and obstetric risk assessment.
- Strain-level profiling (not just species) is needed for obstetric risk prediction.

MYTH-BUSTER

"Douching helps maintain vaginal health."

Reality: Douching disrupts the *Lactobacillus*-dominant community and is associated with increased BV, STI, and PID risk. Every major gynecological society advises against it.

KEY REFERENCES

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- Fransson E et al. Microbiome 2024 — Longitudinal stability. DOI: 10.1186/s40168-024-01000-0
- Norenthag J et al. npj Womens Health 2025 — VaMiGyn cohort. DOI: 10.1038/s44294-025-00048-0
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