

Investigating the Impact of Vaginal *Lactobacillus* Species on *Treponema pallidum* Adhesion

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Background

- Optimal vaginal microbiome features *Lactobacillus* spp. dominance and a low vaginal pH¹
- Vaginal lactobacilli protect against sexually transmitted infections (STIs) (Fig 1)²
- However, the relationship with syphilis has yet to be investigated**
- Treponema pallidum* (*Tp*) is the causative agent of syphilis and its sexual transmission occurs at mucosal sites, like the vagina³
- This study investigates if vaginal lactobacilli protect against *Tp* infections in the female genital tract

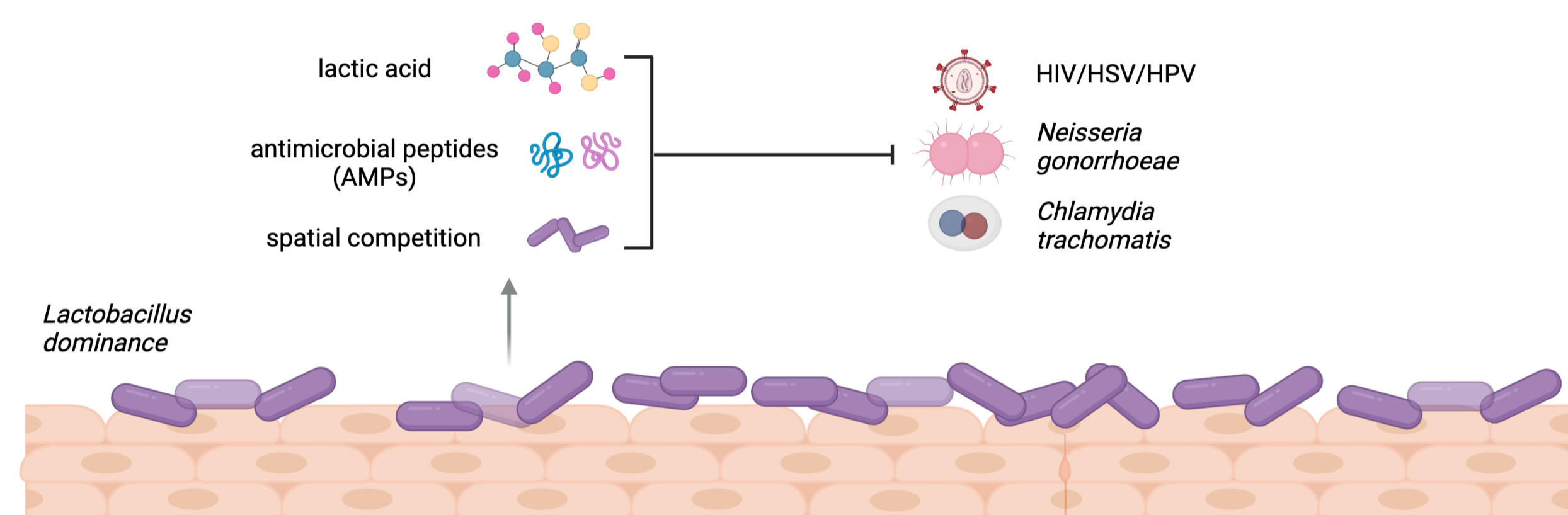
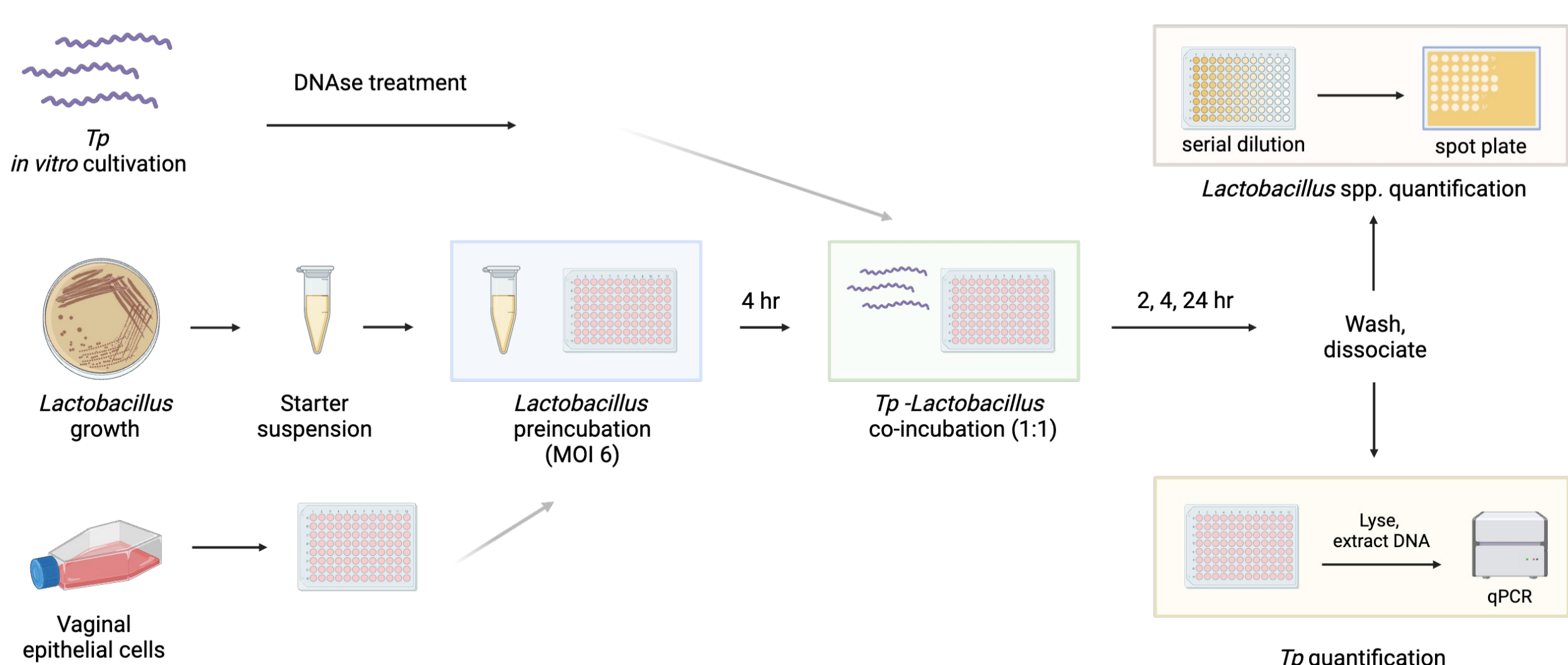


Figure 1. Known mechanisms of *Lactobacillus* spp. colonization resistance.

Objectives

- Optimize assay to assess kinetics of *Lactobacillus* spp. adhesion to vaginal epithelial cells
- Determine whether beneficial *Lactobacillus* species inhibit *Tp* adhesion to vaginal epithelial cells

Methods



Results

Lactobacillus species exhibit increasing adhesion to vaginal epithelial cells over a 24 hour time-course

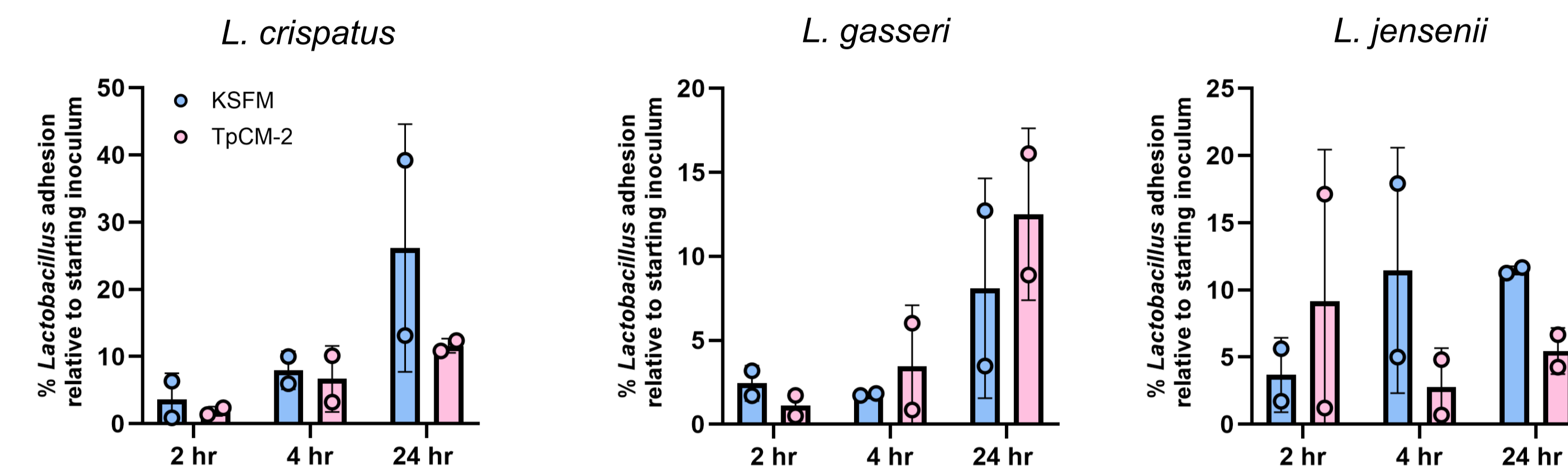


Figure 2. Percentage adhesion of *Lactobacillus* spp. to vaginal epithelial cells (VK2) relative to starting inoculum in keratinocyte serum-free medium (KFSM) or *Tp* culture medium (TpCM-2) over a 24-hour time-course. Data presented as mean \pm standard deviation; each point represents an independent experiment performed in technical triplicate.

Species- and time-dependent differences in *Lactobacillus*-mediated inhibition of *T. pallidum* adhesion to vaginal epithelial cells

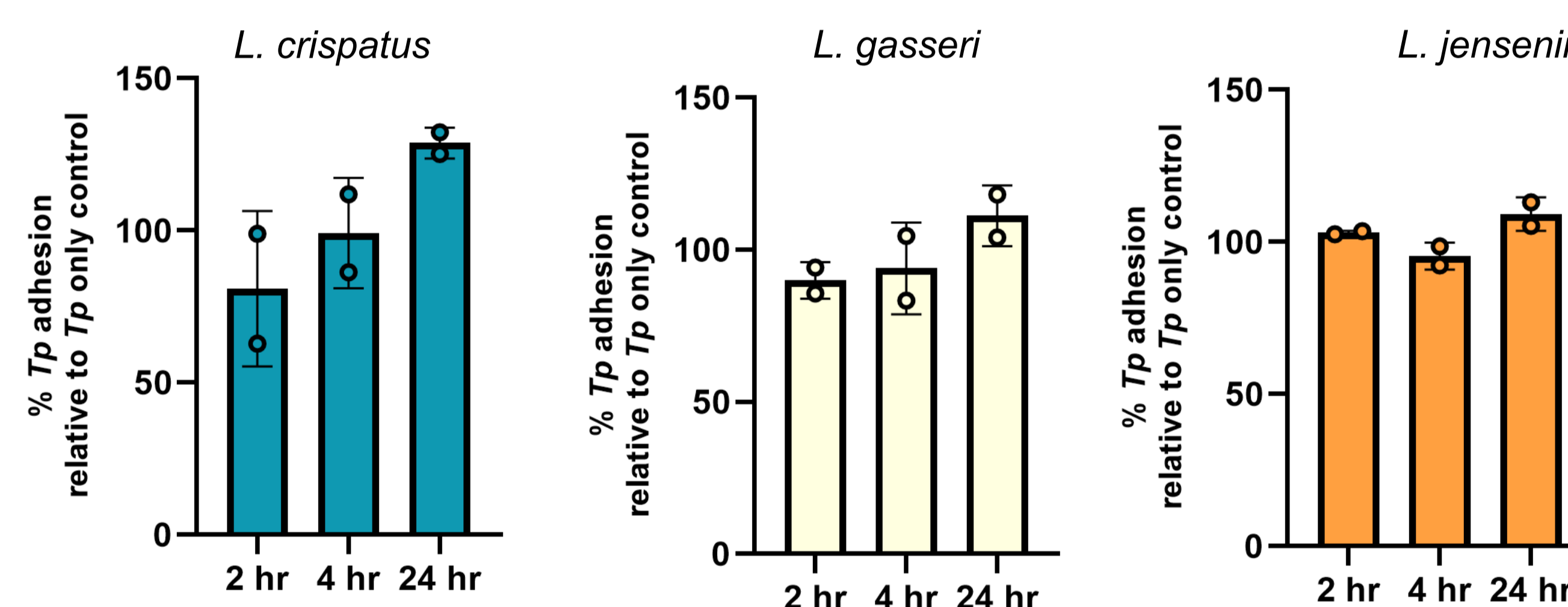


Figure 3. Percentage adhesion of *Tp* to vaginal epithelial cells (VK2) relative to *Tp* only control over 24-hours following 4-hour *Lactobacillus* pre-incubation in TpCM-2. Data presented as mean \pm standard deviation; each point represents an independent experiment performed in technical triplicate.

- Lactobacillus* AMP production may inhibit *Tp* adhesion at 2 hours (\downarrow 19% *L. crispatus*, \downarrow 11% *L. gasseri*)
- Tp* may utilize D-lactate for energy⁴; *Lactobacillus* D-lactate production may enhance *Tp* adhesion at 24 hours (\uparrow 28% *L. crispatus*, \uparrow 11% *L. gasseri*, \uparrow 9% *L. jensenii*)

Lactobacillus species adhesion to vaginal epithelial cells is not impacted by *T. pallidum* presence

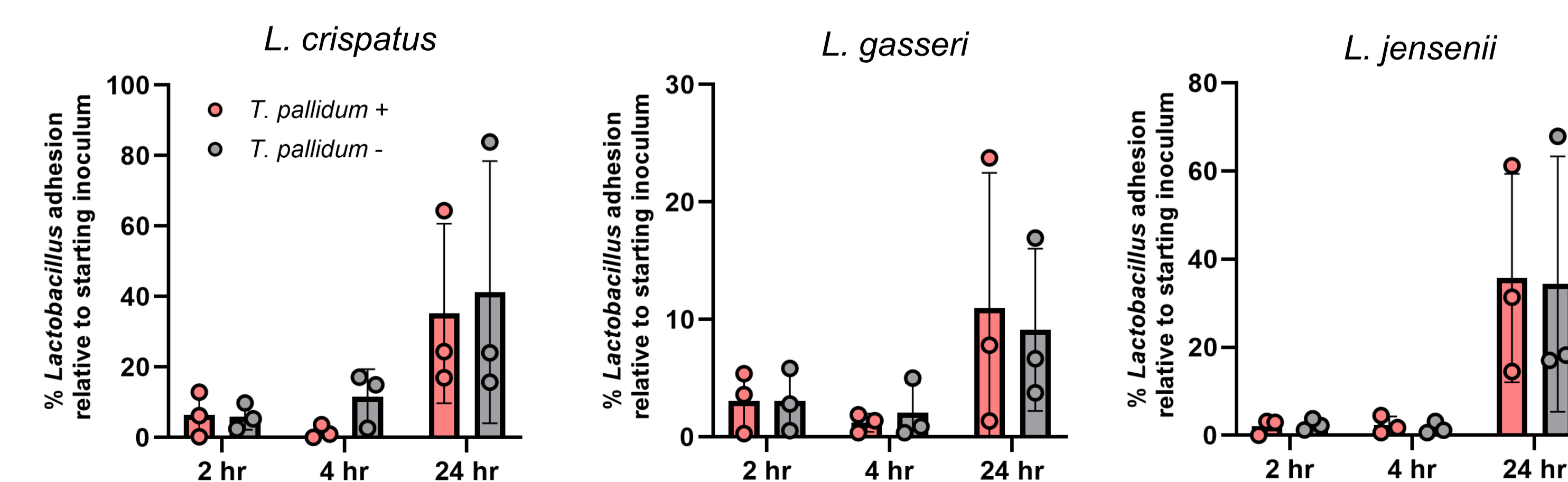


Figure 4. Percentage adhesion of *Lactobacillus* spp. to vaginal epithelial cells (VK2) relative to starting *Lactobacillus* inoculum. *Lactobacillus* pre-incubation for 4 hours in TpCM-2 followed by 24-hour time-course *Tp* infection. Data presented as mean \pm standard deviation; each point represents an independent experiment performed in technical triplicate.

Conclusions

- Optimized an adhesion assay to assess *Tp*-vaginal microbiome dynamics *in vitro*
- Tp* adhesion to the vaginal epithelium differs by *Lactobacillus* species present and incubation time (Fig 3)
 - Tp* adhesion partially inhibited after 2 hours, most prominently for *L. crispatus*
 - Tp* adhesion to vaginal epithelial cells enhanced at 24 hours, most prominently for *L. crispatus*
- Lactobacillus* adhesion to vaginal epithelial cells not impeded by *Tp* (Fig 4)

Future Directions

- Elucidate mechanisms of *Lactobacillus*-mediated inhibition of *Tp* adhesion
- Investigate impact of *Lactobacillus* species lactic acid production on *Tp* adhesion with non-buffered culture medium
- Determine relationship between *Lactobacillus* and *T. pallidum* at different multiplicity of infection (MOI)

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