

Competition and mutualism in the dysbiotic vaginal microbiome

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The costs of Bacterial Vaginosis (BV)

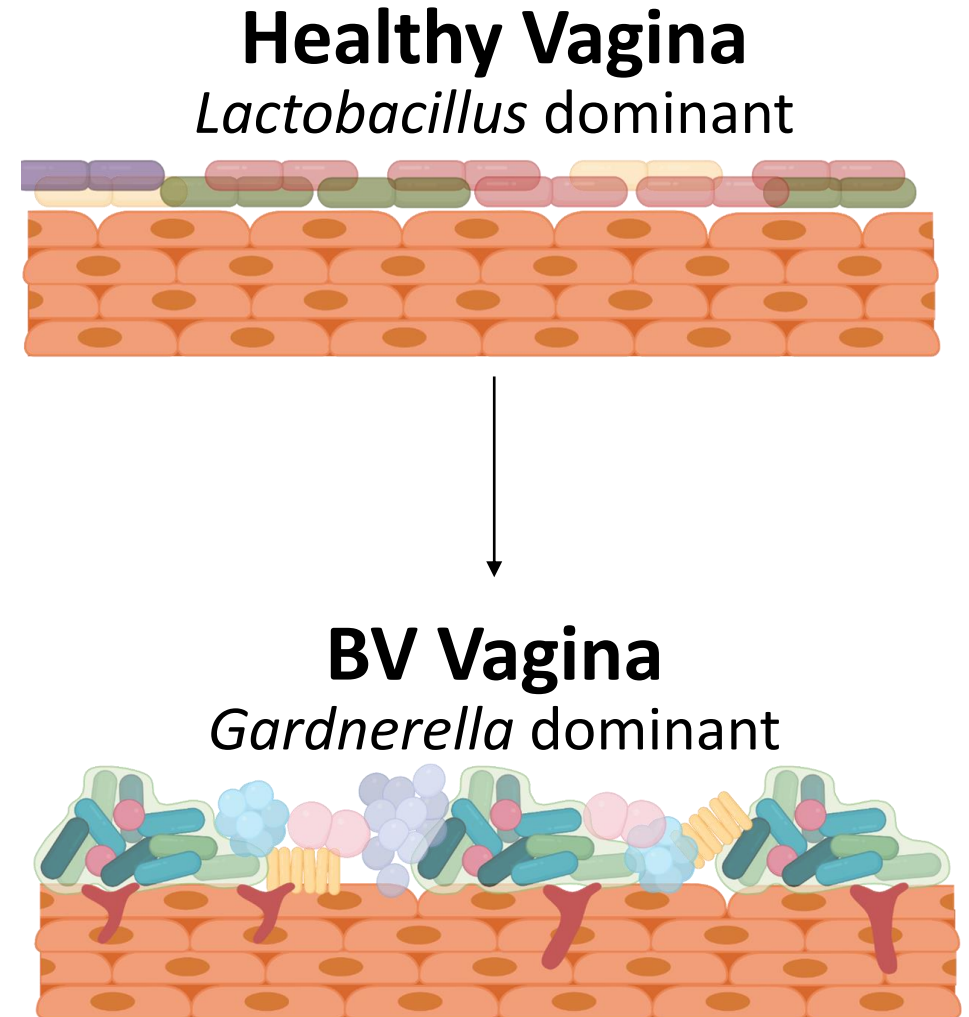
27.4% of Reproductive age women

58% Recurrence 12 months post-treatment

\$1.3 Billion annual treatment cost

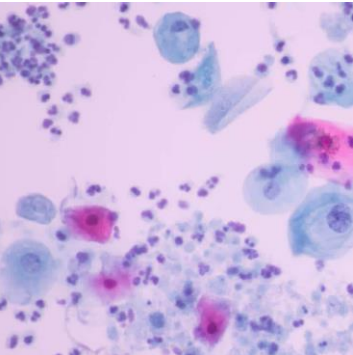
\$3.6 Billion BV-associated HIV and preterm birth healthcare cost

Increased risk of: STD's, preterm birth, pelvic inflammatory disease



Problem: BV is a polymicrobial condition; Lack of information regarding how multiple species interact metabolically

Metabolic Models

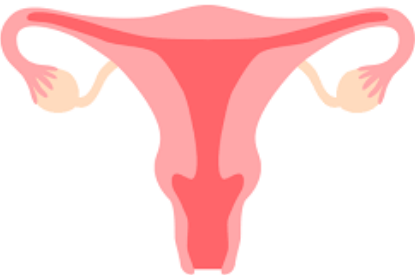


195 *Gardnerella*
7 Co-occurring Species



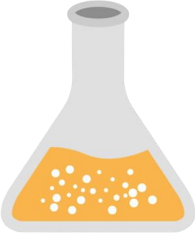
Emma Glass

Media



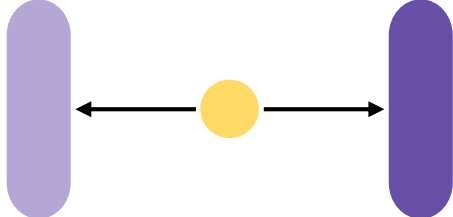
BV+ Cervical Vaginal Fluid =
Metabolomics

+

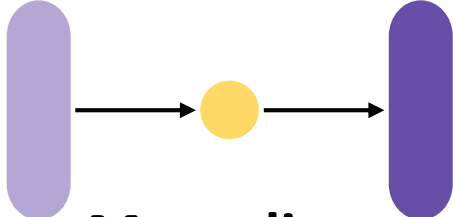


Minimal Media =
20% Growth in Mono Culture

Simulations



Competition



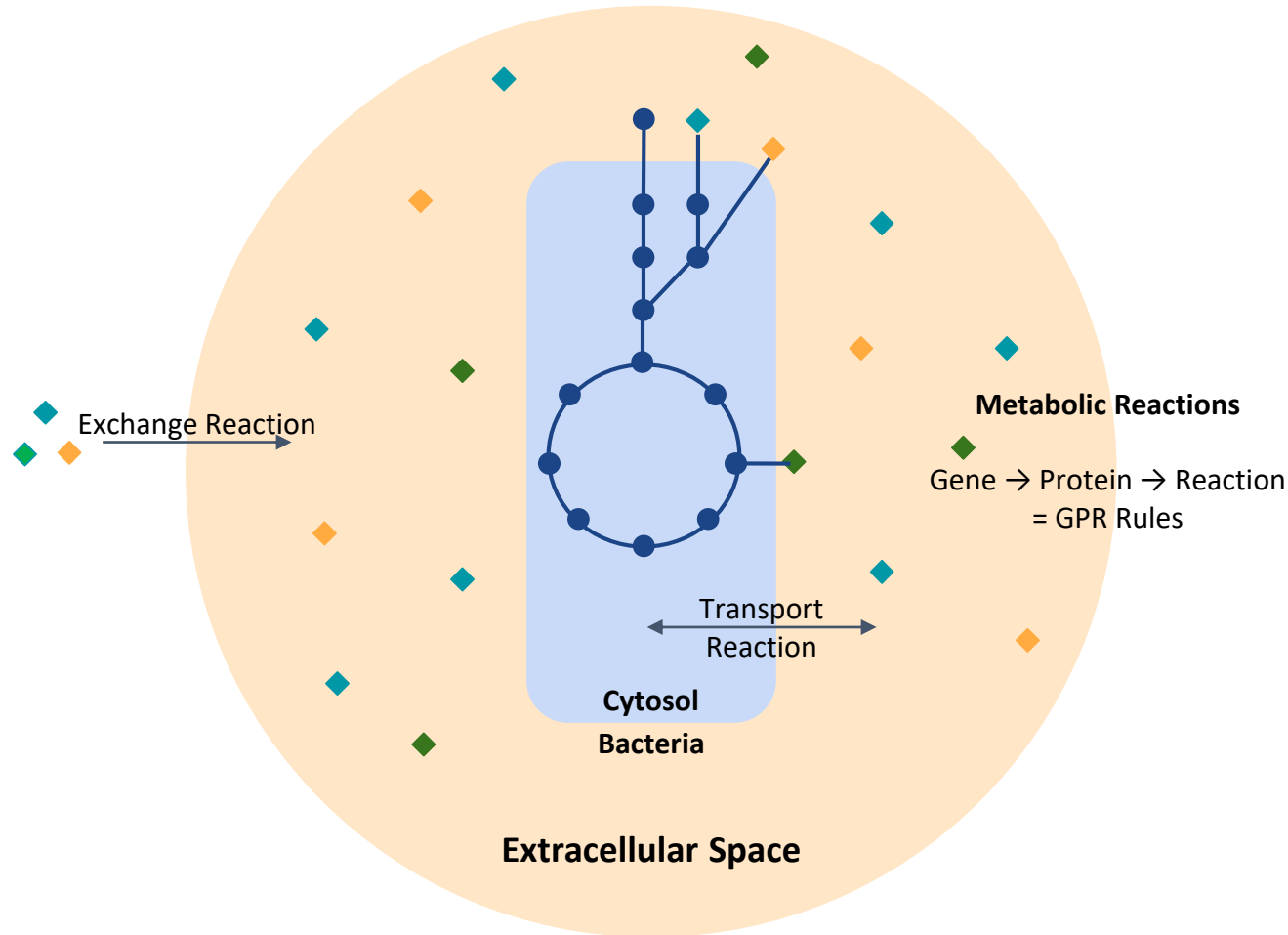
Mutualism



Dr. Matt Jenior



What is a metabolic network model?

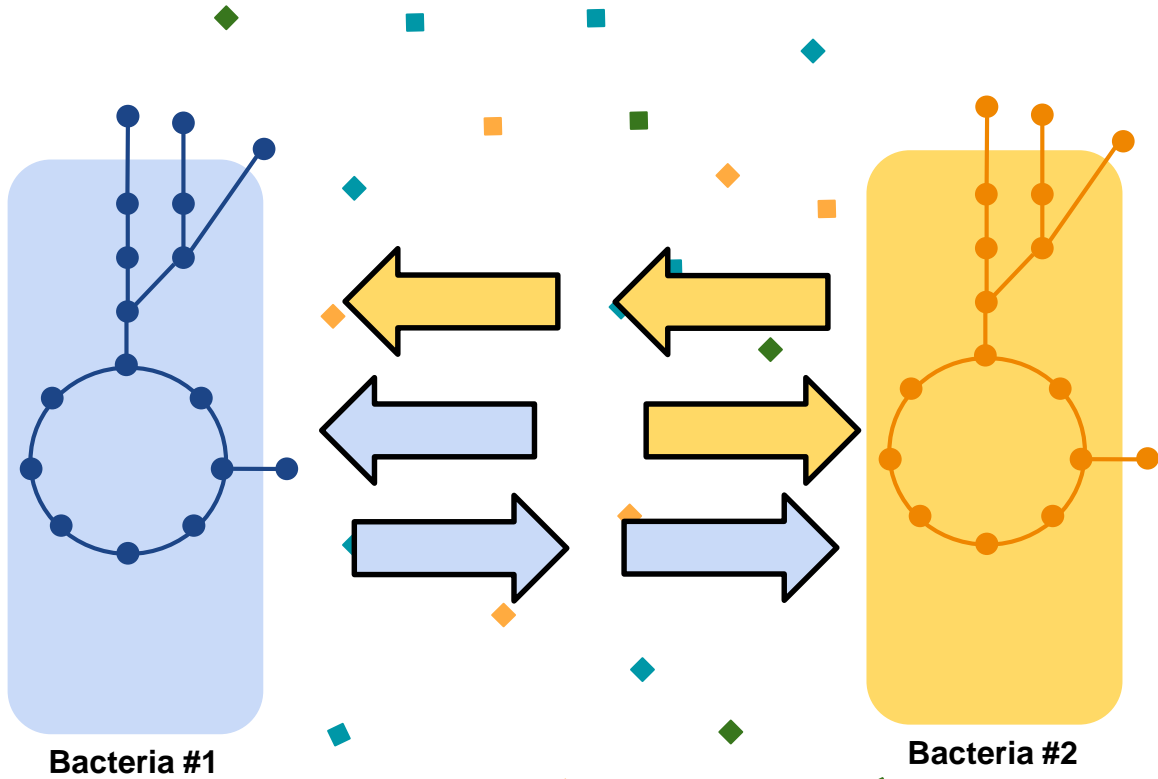


How do we use them?

Simulate the metabolic conditions of the vagina

Predict what reactions are used to help the model “grow”

Quantifying competition and mutualism *in silico*



Competition

Using FVA remove analysis (FVA) and the approach to quantify the decrease in biomass

Sum of decrease in biomass of both bacteria is the quantitative value of competition

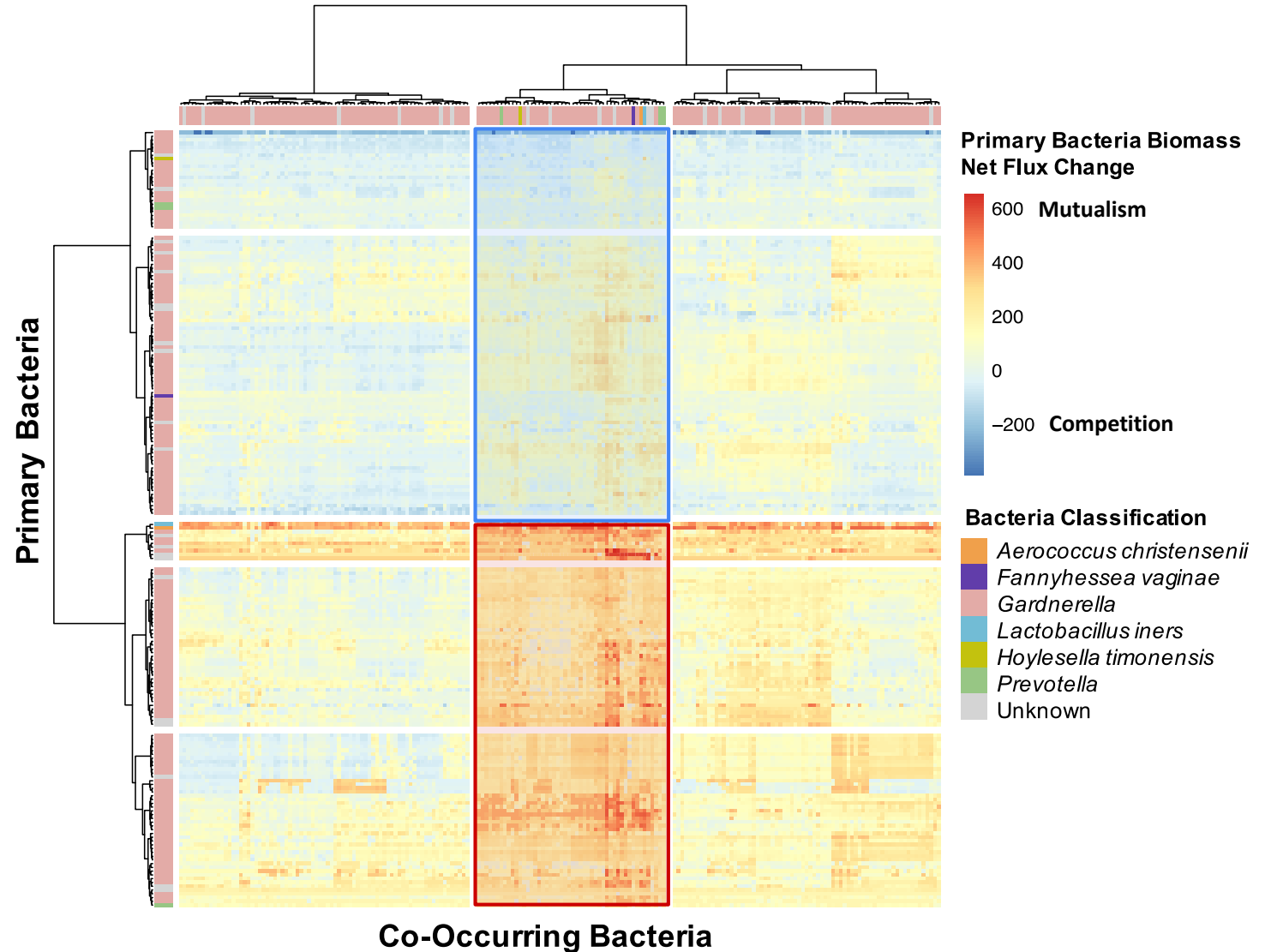
Sum of competed for metabolite's biomass decrease is the quantitative value of competition



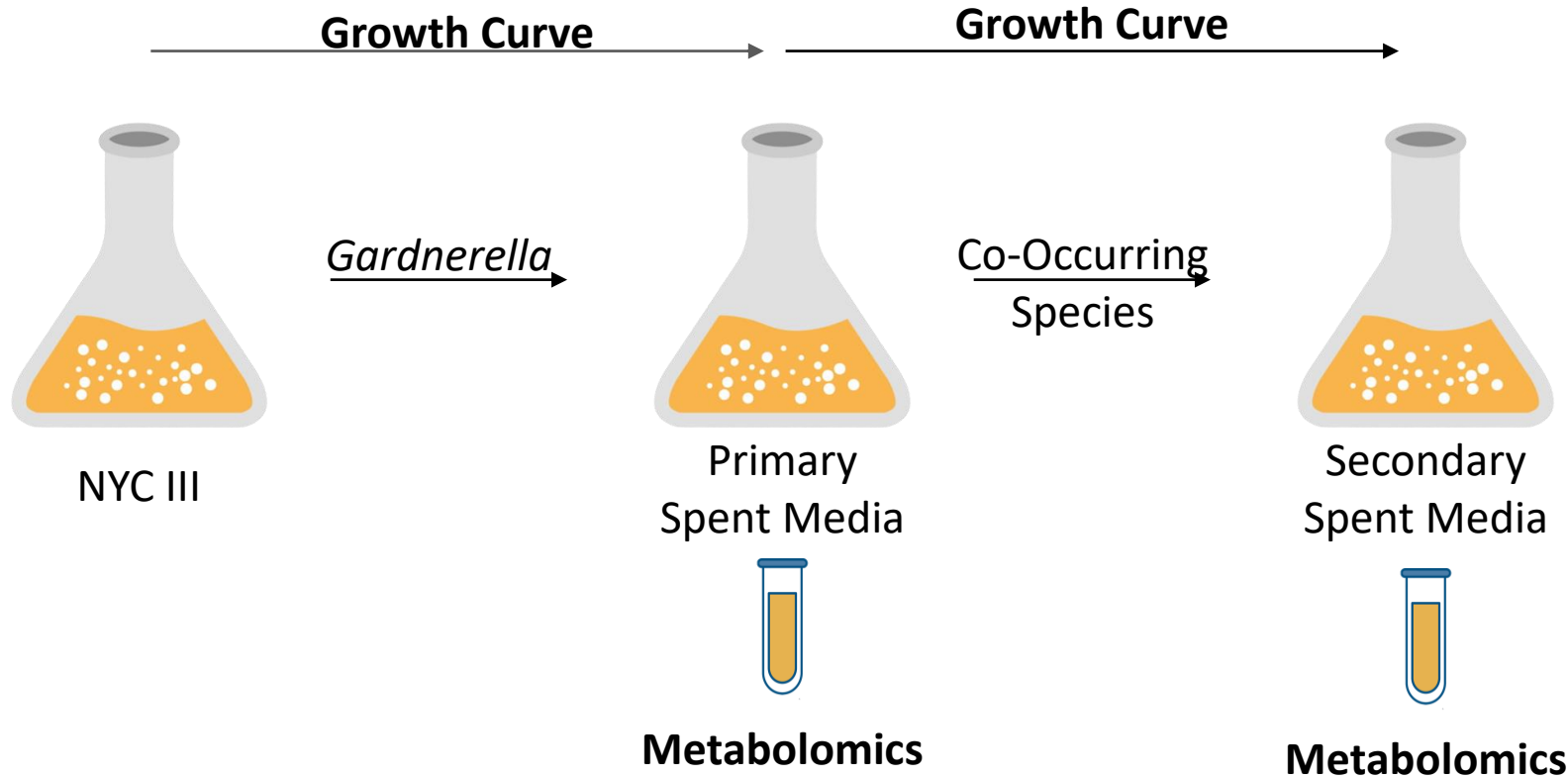
BV+ Cervicovaginal Fluid

Genetic relatedness does not correlate with functional relatedness

Biomass impact of the co-occurring bacteria significantly varies across *Gardnerella* strains



in vitro metabolomics analysis



Gardnerella

piotti
vaginalis

Co-Occurring Species

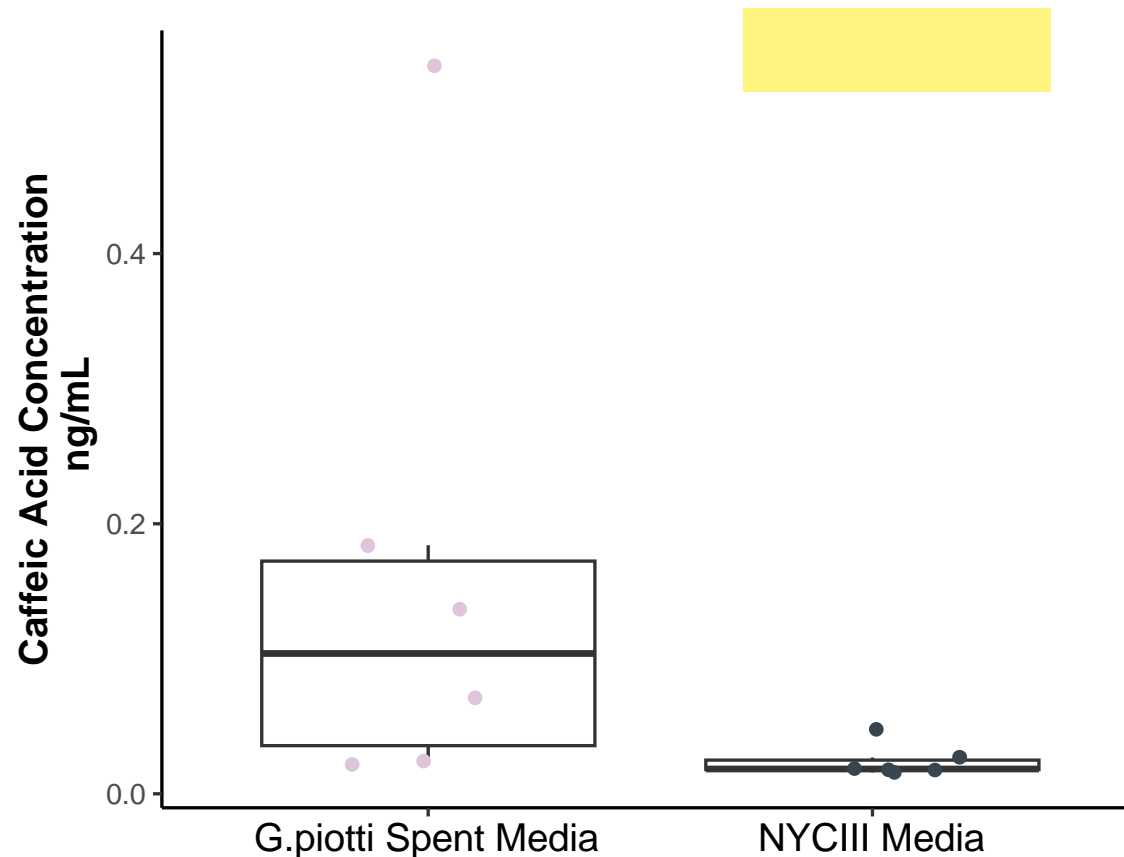
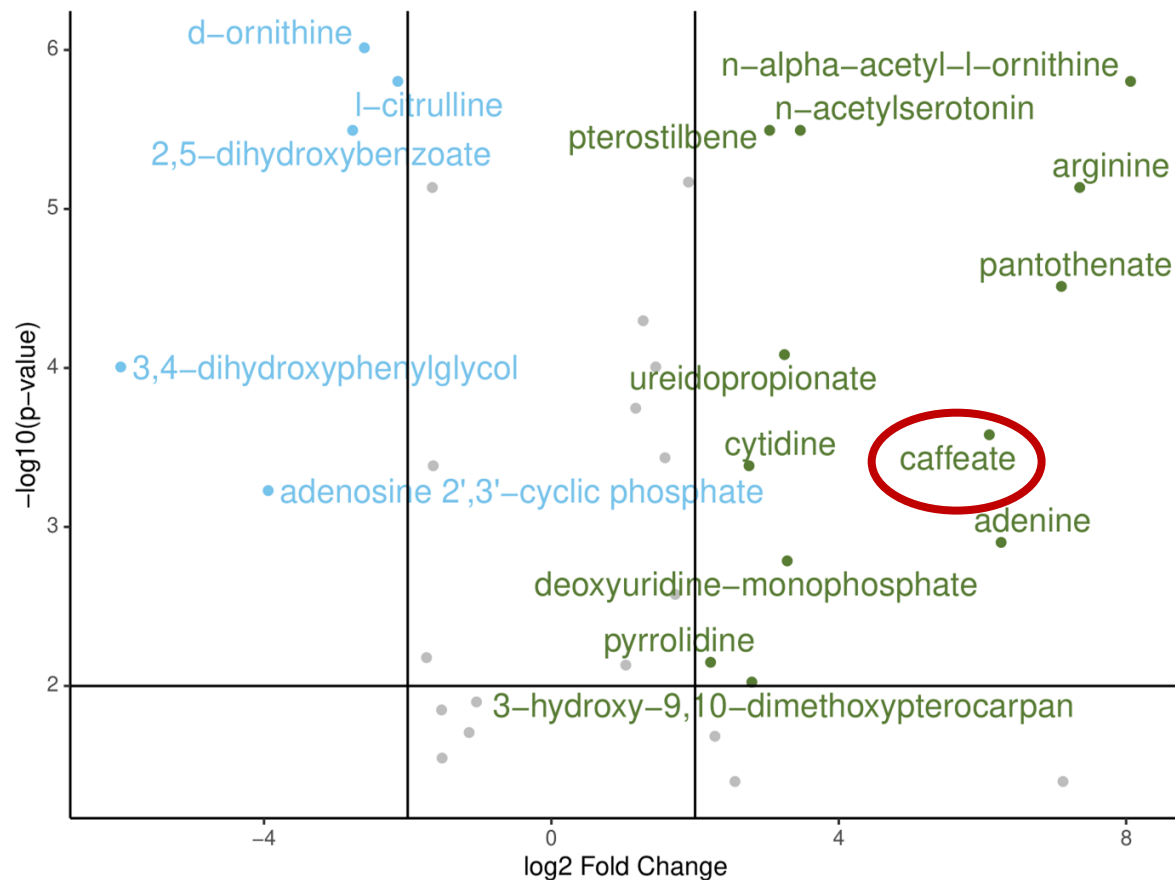
Lactobacillus iners
Fannyhessea vaginae
Aerococcus christensenii
Hoylella timonensis
Prevotella amnii
Prevotella buccalis



Dr. Glynis Kolling



F. vaginae produces caffeate specifically in the context of BV



F. vaginae in *G. piotti* spent media

Produced

Consumed



Conclusion

Genetic relatedness does not correlate with functional relatedness in the vaginal microbiome

F. vaginae produces caffeate specifically in the context of BV

Future directions

The high degree of strain and species level variation highlight the need for BV diagnostic subcategories to more accurately define an individual's type of BV dysbiosis

Further investigate the role of BV specific metabolic byproducts on host tissue regulation

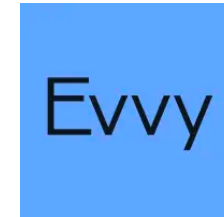
Thank you

Lab

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