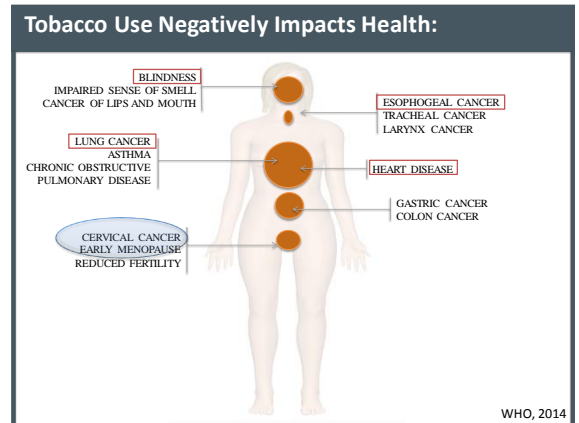
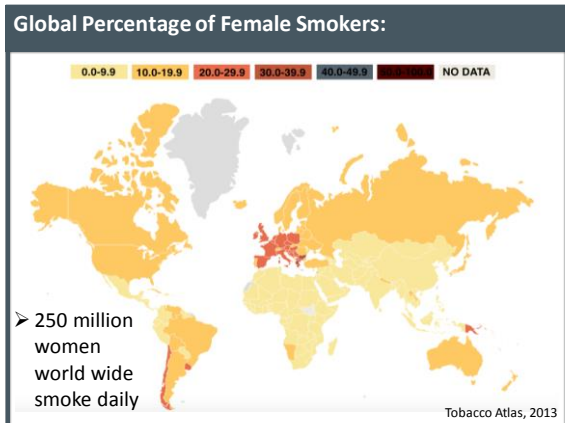


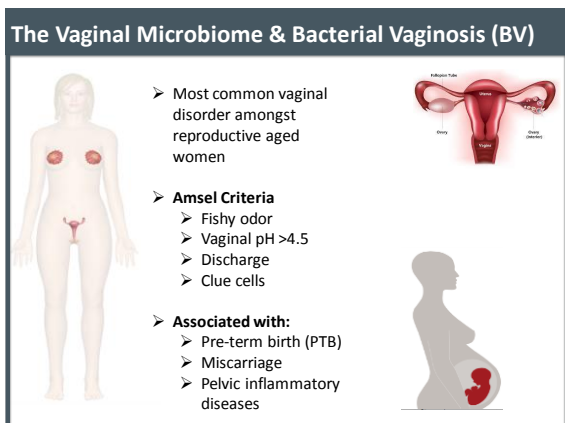
Cigarette Smoking is Associated with an Altered Metabolomic Profile in the Vaginal Tract

Tiffanie Nelson¹, Joanna-Lynn Borgogna¹, Rebecca Brotman² & Carl Yeoman¹

¹Montana State University | ²University of Maryland

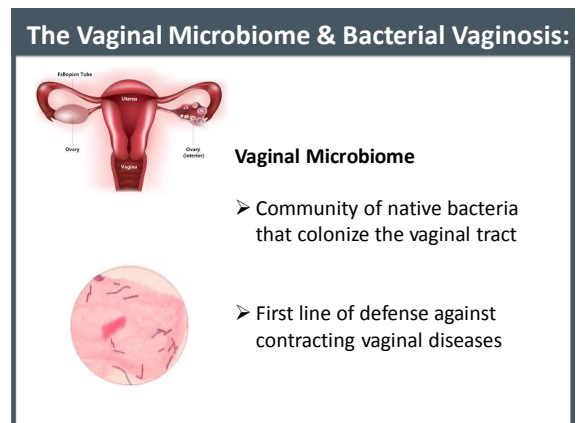



The Vaginal Microbiome & Bacterial Vaginosis (BV)



- Most common vaginal disorder amongst reproductive aged women
- **Amsel Criteria**
 - Fishy odor
 - Vaginal pH >4.5
 - Discharge
 - Clue cells
- **Associated with:**
 - Pre-term birth (PTB)
 - Miscarriage
 - Pelvic inflammatory diseases

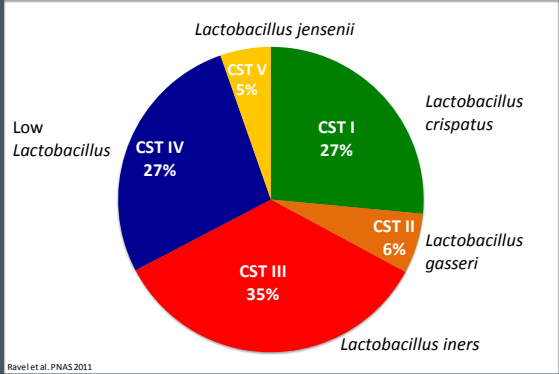
The Vaginal Microbiome & Bacterial Vaginosis:



Vaginal Microbiome

- Community of native bacteria that colonize the vaginal tract
- First line of defense against contracting vaginal diseases

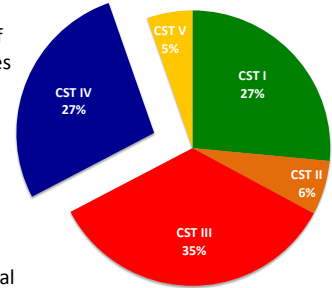
The Vaginal Microbiome: Community State Types (CST)



The low *Lactobacillus* Community State - CST IV:

CST IV is characterized by:

- Higher diversity of anaerobic Species
 - Prevotella
 - Dialister
 - Streptococcus
- High pH – 5.3
- Associated with increased risk for common urogenital disorders & STIs



Smoking and the Vaginal Microbiome:

- Part 1 – How does smoking impact the vaginal microbiome?
- Part 2 – How does smoking affect the vaginal metabolome?



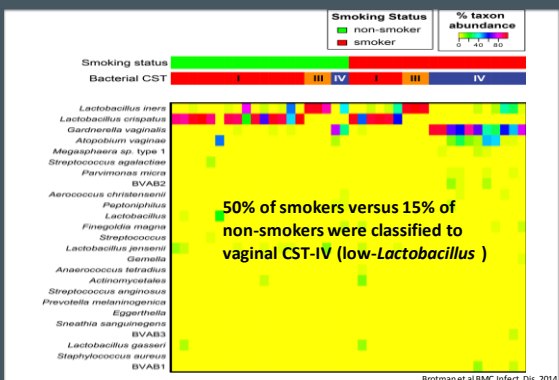
Smoking and the Vaginal Microbiome:

- Pilot Study:
 - 20 non-smokers
 - 20 smokers
 - Self-collected vaginal swabs
 - Microbiome analysis using 454 16S rRNA gene sequencing



Brotman et al BMC Infect. Dis. 2014

Smoking Negatively Affects the Microbiome:



Smoking and Reproductive Health:

- How does smoking impact the vaginal tract and women's reproductive health?
- Part 1 – How does smoking impact the vaginal microbiome?
- Part 2 – How does smoking affect the vaginal metabolome?



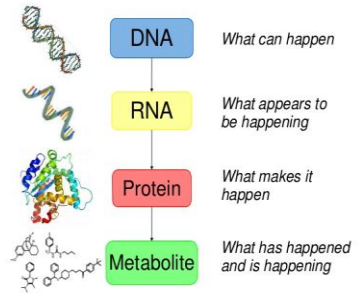
Metabolome:

Complete set of small-molecule chemicals found within a biological sample



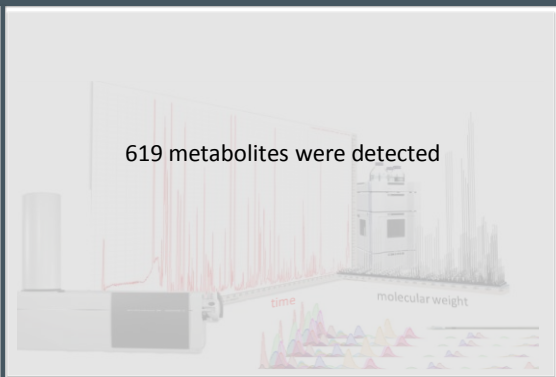
Metabolome is Closely Tied to Phenotype:

The central dogma of biology

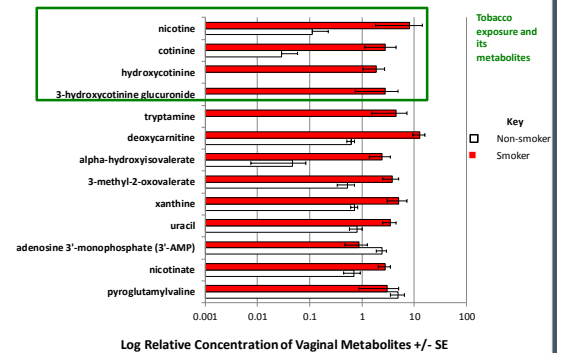


Sampling Method for Metabolomics:

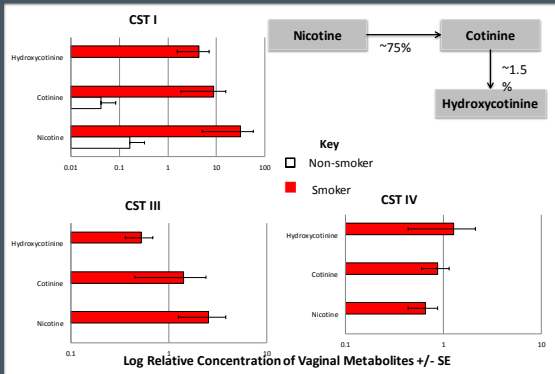
619 metabolites were detected



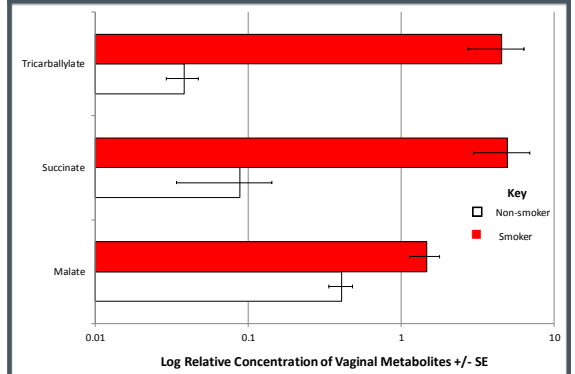
Metabolite Differences between Smokers and Non-smokers

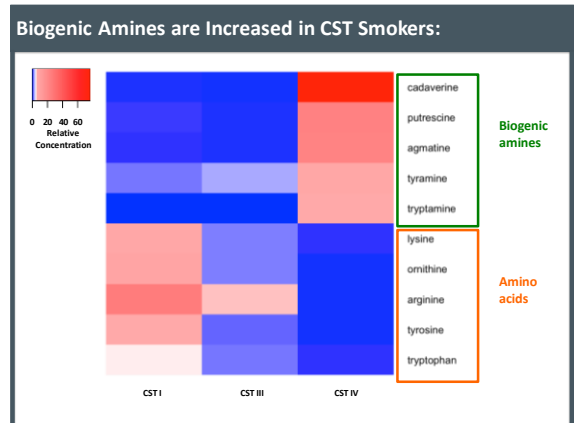
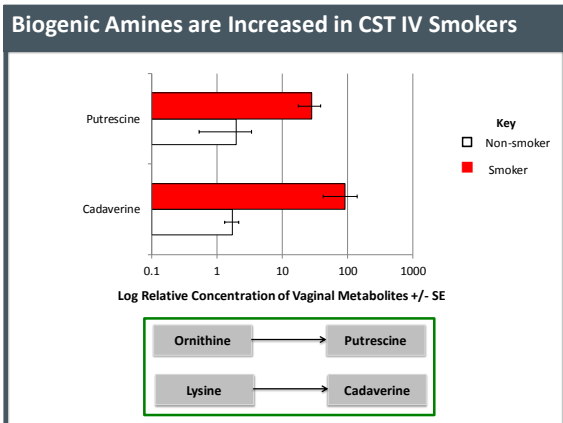
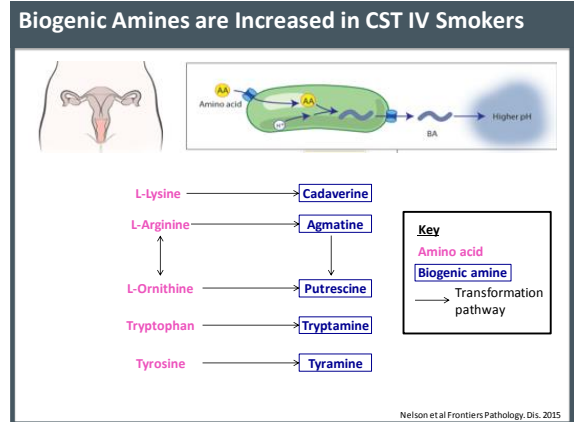
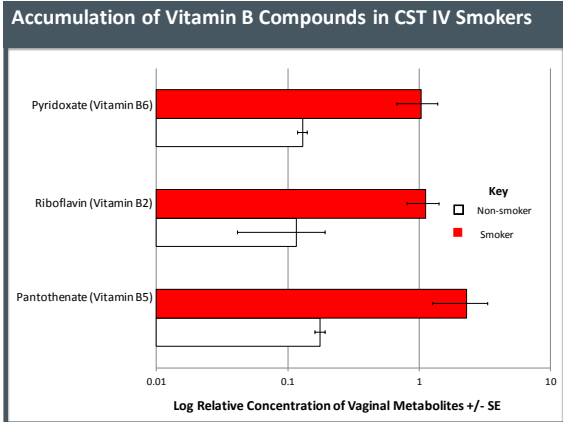


Tobacco Constituents are Much Higher in Smokers



Accumulation of TCA Related Compounds in CST IV Smokers:





- ### Conclusions:
- Smoking associated with a disrupted microbiota
 - Increases odds of being categorized as CST IV
 - Smoking directly affects the vaginal metabolome
 - Nicotine and breakdown compounds present in vagina
 - Vitamin B is increased in smokers vs non-smokers suggesting uptake deficiencies
 - Biogenic amines are increased in smokers vs non-smokers

Acknowledgements

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Study Lead:
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 University of Maryland School of Medical Sciences
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MONTANA STATE UNIVERSITY

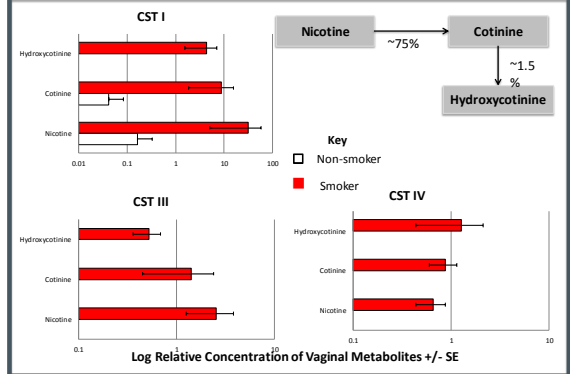
Collaborators
 Dr. Carl Yeoman, Montana State University
 Dr. Tiffanie Nelson, Montana State University
 Dr. Jacques Ravel, University of Maryland
 Dr. P Gajer, University of Maryland

NIH National Institute of Allergy and Infectious Diseases

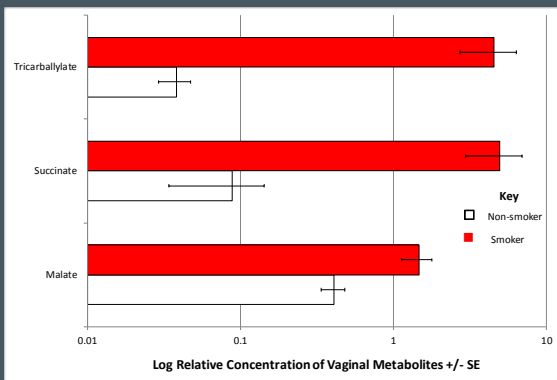
METABOLON

Questions?

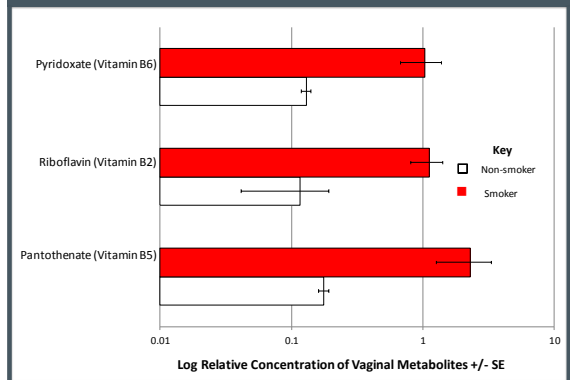
Tobacco Constituents are Much Higher in Smokers



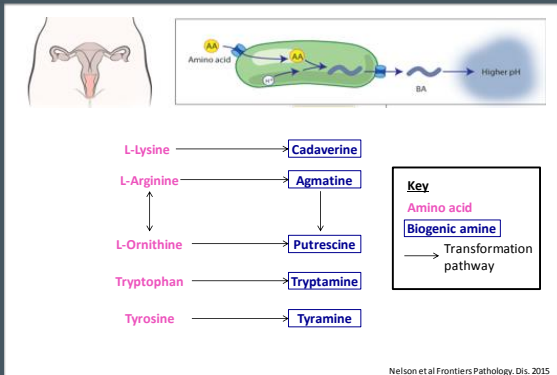
Accumulation of TCA Related Compounds in CST IV Smokers:



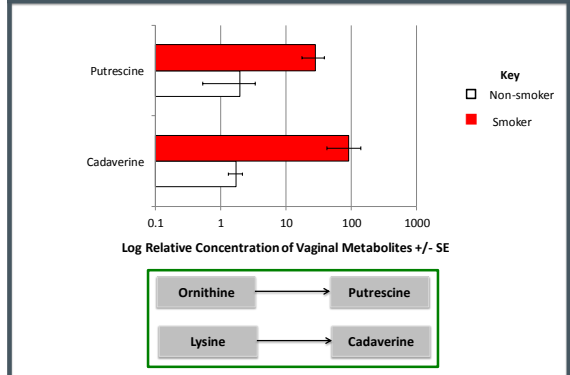
Accumulation of Vitamin B Compounds in CST IV Smokers



Biogenic Amines are Increased in CST IV Smokers



Biogenic Amines are Increased in CST IV Smokers



Nelson et al Frontiers Pathology, Dis. 2015

