Urethral & Coronal Sulcus Microbiome of Adolescent Males

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Urethral Microbiome of Adolescent Males
Form, Function, and Microbiota

• The multiple microbiomes of the penis
  – Urethra
  – Coronal sulcus

• Episodic interaction with other microbial communities during partnered sexual activities
  – Vagina
  – Oro-pharynx
  – Anus and rectum

• Sexually transmitted infections
Anatomical relationships of urethra, prostate gland, and bladder
Different microbial communities in 3 forms of urethritis

No Urethritis

- 6 others
- Corynebacterium
- Atopobium
- Gemella
- Aerococcus
- Streptococcus
- Prevotella
- Sneathia

C. trachomatis

- 20 others
- Stenotrophomonas
- Acidocella
- Prevotella
- Pelomonas
- Caulobacter
- Rickettsia
- Micrococcus

N. gonorrhoeae

- Prevotella
- TM7
- Variovorax
- Veillonella
- Bradyrhizobium
- Microbacterium
- Propionibacterium
- Rhizobium
- Staphylococcus
- Neisseria

Urethritis – unknown etiology

- 11 others
- Micrococcus
- Burkholderia
- Flavobacterium
- Prevotella
- Pelomonas
- Aquabacterium
- Staphylococcus
- Corynebacterium

Van Der Pol et al. in preparation
Urethral Microbiome of Adolescent Males

Developmental Change during Adolescence

• Physical growth associated with puberty
• Initiation of partnered sexual activities
• Partner change
Fellatio, Vaginal & Anal Sex (past 90 days)
U.S. Males, ages 14-17

Fortenberry et al, J Sexual Med, in press
Urethral Microbiome of Adolescent Males

How to study behaviorally mediated interactions of microbiota over time

- Characterize prior exposure status
- Describe the existing microbiome
- Capture new exposures and changes in existing microbiome
- Repeat over time
Urethral Microbiome of Adolescent Males

Specimens

• Behavioral self-report (enrollment & quarterly)

• Daily behavioral report by cell phone diary

• Surveillance specimens (enrollment & monthly)
  – Urine
  – Coronal sulcus

• Event-contingent urine
  – Oral, anal, vaginal sexual exposures
  – Genital symptoms
Urine is an appropriate sample for study of male urethral microbiome
Comparison of 20 Most Common Genera in Urine and Urethral Swab – Men without STI

- Corynebacterium
- Lactobacillus
- Sneathia
- Prevotella
- Mycoplasma
- Veillonella
- Ureaplasma
- Streptococcus
- Anaerococcus
- Staphylococcus
- Haemophilus
- Aerococcus
- Propionibacterium
- Atopobium
- Enterococcus
- Gemella
- Bradyrhizobium
- Finegoldia
- Ralstonia
- Pelomonas
Comparison of 20 Most Common Genera in Urine and Urethral Swab – Men with STI
Preliminary Data

Adolescent Males
Sociodemographic characteristics, circumcision status, and sexual behavior at enrollment

<table>
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<th></th>
<th>White N=7</th>
<th>Black N=7</th>
<th>Latino N=4</th>
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<td>5</td>
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<td>Anal sex</td>
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</table>
Comparison of 10 Most Common Genera in Uncircumcised and Circumcised Adolescents – Coronal Sulcus Swabs & Urine

- Streptococcus
- Staphylococcus
- Corynebacterium
- Anaerococcus
- Lactobacillus
- Prevotella
- Peptoniphilus
- Gardnerella
- Veillonella
- Finegoldia

Graph showing the comparison of genera abundance in swab and urine samples between uncircumcised and circumcised adolescents.
Comparison of 10 Most Common Genera in Adolescents with and without Prior Oral/Vaginal Sex – Coronal Sulcus
Comparison of 10 Most Common Genera in Adolescents with and without Prior Oral/Vaginal Sex – Urine
*Lactobacillus* qPCR over time
8 participants - urine
Gardnerella qPCR over time, urine
5 participants
Ethical issues in study of adolescents

• Understanding of issues associated with genomic research
• Issues related to prospective study of sexual behavior
• Balance of adolescent autonomy and parental involvement
• Cell telephones as a research tool and a research incentive/payment
Urethral & Coronal Sulcus Microbiome of Adolescent Males – Current Status

- 134 monthly samples
- 23 event-contingent based on symptoms or exposures (7 samples for each event)
- 3058 diary days (88% of expected)
- Sample expansion to 54 by 9/15/2010
Discussion

The intersection between male sexual behavior and microbial communities in adolescents

• Urethra and coronal sulcus have distinct but related microbial populations

• Evidence of relatively stable population in distal urethra

• Circumcision alters composition of both coronal sulcus and urethra

• Possible alteration of microbial communities by sexual exposures