

## Background

This study compares the oral microbial profiles of children with early childhood caries (ECC) with low caries risk children and evaluate profile changes after surgical and behavioral interventions.

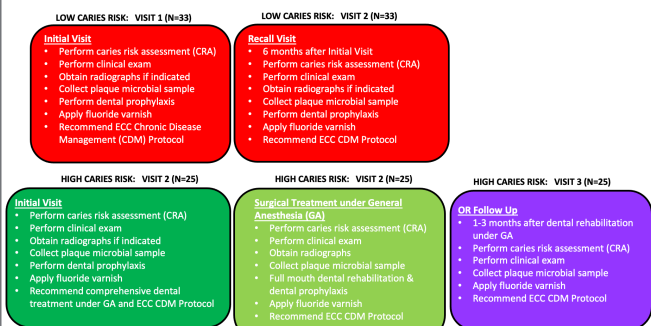
- ECC which occur in children under the age of six, is a common cause of disease and can have serious sequelae if untreated, including infections and, in severe cases, life-threatening facial space involvement.<sup>1</sup>
- The caries disease management (CDM) protocol implemented at Boston Children's Hospital includes patient/parent coaching of factors that increase risk or protect against dental disease to encourage effective day-to-day dietary and home care modifications in addition to surgical intervention if indicated. This treatment protocol has led to improved patient outcomes such as fewer referrals for restorative treatment under general anesthesia and reduction in new tooth cavitations and pain.<sup>2</sup>

While the clinical effectiveness of CDM of ECC protocol in decreasing disease burden is clear, this study is interested in the previously unknown association of modified behaviors with changes in the oral microbiota. Deeper knowledge of the human oral microbiota in health and disease is an important step in considering ways in which the oral microbiota could be manipulated to promote improved health.

**Specific Aim 1:** To profile the oral microbial composition and of children ages 1 to 5 years with low and high caries risk and correlate with their caries risk assessment and clinical dental findings.

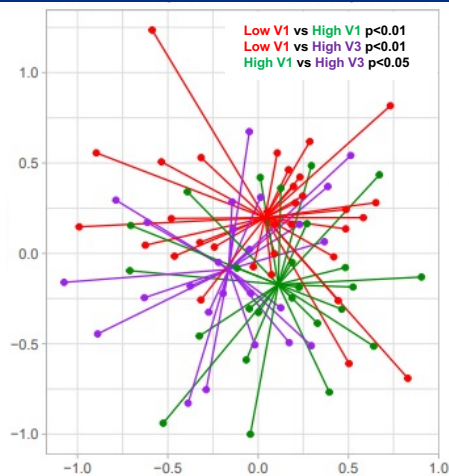
**Specific Aim 2:** To assess the modulation of microbial community composition in high caries risk children following the therapeutic interventions with chronic disease management visits and dental rehabilitation under general anesthesia.

## Methods

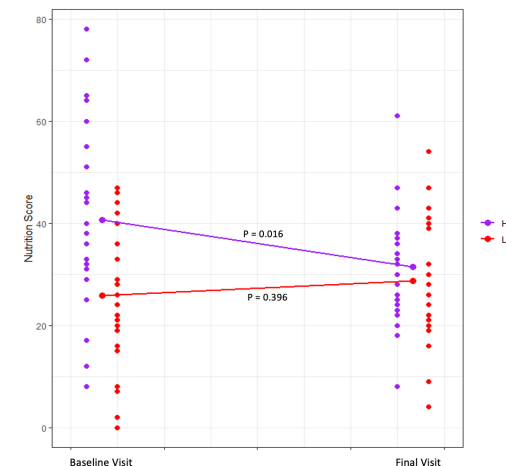


**Figure 1.** Schematic for the experimental design for high and low-risk groups following caries disease management protocol. Healthy children ages 1-5 years were enrolled in this 6-month longitudinal study. Plaque samples were obtained at each visit and analyzed using 16s rRNA gene sequencing.

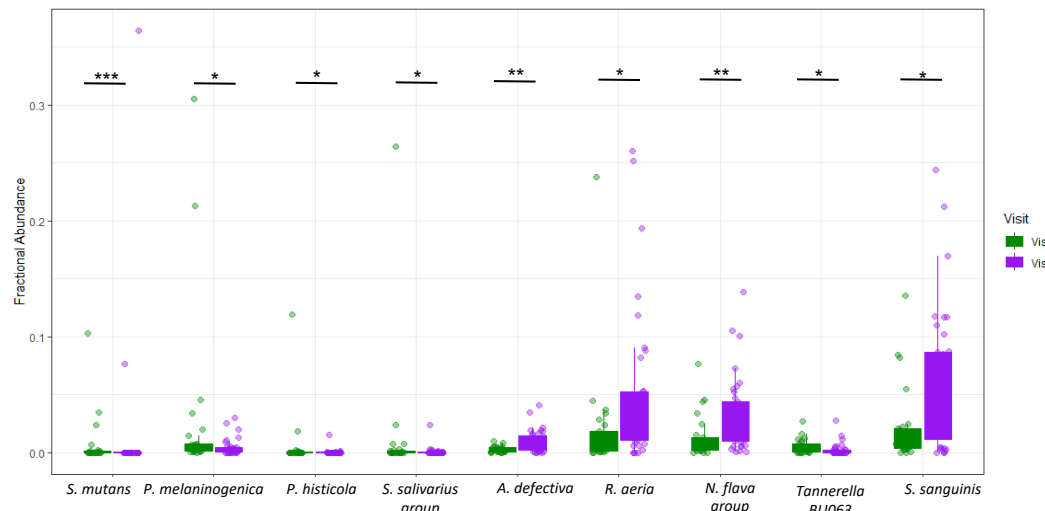
## Results



**Figure 2.** 16S rRNA gene sequencing of Low Visit 1, High Visit 1, and High Visit 3 biofilm samples. Nonmetric multidimensional scaling plot using Bray-Curtis dissimilarities.



**Figure 3.** Linear regression analysis shows that cariogenicity scores decreased in high caries risk individuals over time.



**Figure 4.** Fractional abundances for significant species in plaque samples of individuals with ECC over a 6-month period with Visit 1 being pre-surgical treatment and Visit 2 being post-operative. Asterisks and horizontal bars indicate significant difference in bacterial species count from visit 1 to visit 2, \*P<.05, \*\*P<.01, \*\*\*P<.001.

## Results (cont.)

Species	q	Slope Est (V1 vs V3)	Association with Oral Health
<i>Streptococcus mutans</i>	2.64E-04	-4.57	Cariogenic
<i>Prevotella melaninogenica</i>	0.029	-1.13	Cariogenic <sup>3</sup>
<i>Prevotella histicola</i>	0.029	-1.55	Cariogenic <sup>3</sup>
<i>Streptococcus salivarius</i>	0.046	-1.26	Cariogenic <sup>6</sup>
<i>Abiotrophia defectiva</i>	0.002	1.21	Health <sup>5,6</sup>
<i>Rothia aeria</i>	0.006	1.21	Health <sup>7</sup>
<i>Neisseria flava group</i>	0.010	1.04	Health <sup>8</sup>
<i>Tannerella BU063</i>	0.042	-1.28	Health <sup>9</sup>
<i>Streptococcus sanguinis</i>	0.046	0.90	Health <sup>4</sup>

**Table 1.** Nine species showed significant change in high caries risk subjects after dental rehabilitation (Visit 1 compared to Visit 3). Negative trends were observed over time in cariogenic species with the exception of Tannerella BU063 which is associated with periodontal health.

## Conclusion

Unique profiles for high and low caries risk subjects were observed with changes in high-risk subjects seen over the six-month follow-up period, highlighting cariogenic microbial community composition shift toward a health-associated composition after restorative treatment and behavioral intervention.

## References

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