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Prospective study of oral health in children and adults with cystic fibrosis (CF)

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BACKGROUND

- Higher rates for oral diseases (caries and gingivitis) have been described in adults and adolescents with CF (pwCF) compared to the general population (Chi PMID23758751).
- Risk factors in pwCF include more frequent meals, altered saliva flow and possibly lower pH, and medications, that may affect salivary microbiota.

Study Goals

- Measure oral health and behavioural and biological risk factors for oral disease in pwCF.
- Here we assess correlation of oral characteristics with saliva microbiome and clinical measures.

METHODS

- Ongoing, prospective multi-center study in pwCF ages 12-30 years.
- Dentists perform standardized dental evaluation related to dental caries, enamel defects and gingivitis.
- Collection of unstimulated saliva to measure saliva flow, pH and microbiome.
- 16S rRNA microbiome analyses was done by Illumina sequencing of V3-V4 region with ASV determination by dada2-QIIME2. Taxonomic identification was performed mapping ASVs to the Human Oral Microbiome database.
- Collection of clinical data at time of clinical visit included demographics, lung function, microbiology and medications.
- Lung function and microbiology were included for the preceding 12 months.

RESULTS

Subject characteristics

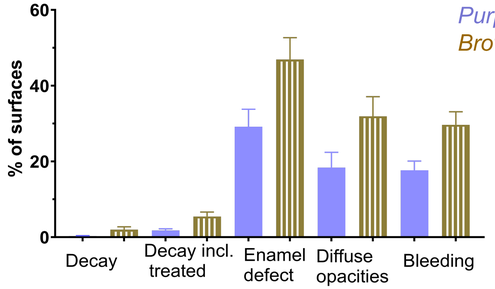
	Total cohort N=104	pwCF <18 y. N=53	pwCF ≥18 y N=51
Age mean (SD)	18.5 (5.1)	14.5 (1.7)	22.6 (4.1)*
FEV_1 % pred. GLI mean (SD)	99.7 (19.1)	107.9 (14.4)	91.2 (19.7)*
On CFTR modulator	91 (88%)	45 (85%)	46 (90%)
On chronic antibiotic	19 (18%)	9 (17%)	10 (20%)
***S. aureus pos.* #**	29 (36%)	22 (46%)	7 (22%)*
***P. aeruginosa* #**	8 (10%)	2 (4%)	6 (19%)*
Diabetes	7 (7%)	1 (2%)	6 (12%)*

N=80 for culture. *p<0.05 for age group comparison.
No differences in clinical characteristics between those on or not on CFTR modulators..

Less oral disease in adolescents than adults

- Frequency of different oral findings did not differ by age group (data not shown) but extent of oral disease is higher in older subjects (Fig. 1).

Figure 1: Extent of dental and gingival findings



* p<0.05 by Fisher's exact Ped. vs. Adult for each oral disease finding.

RESULTS

Association of different saliva microbiome diversity measures with lung and oral health

Fig. 2: Correlation FEV_1% to saliva microbiome diversity (only in adults).

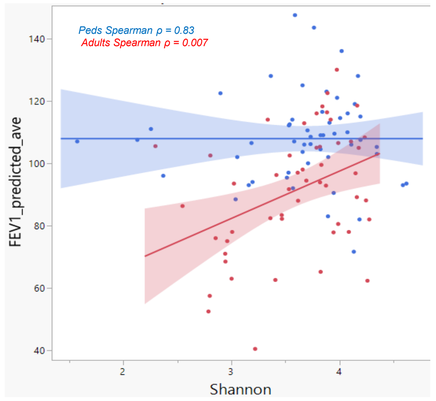
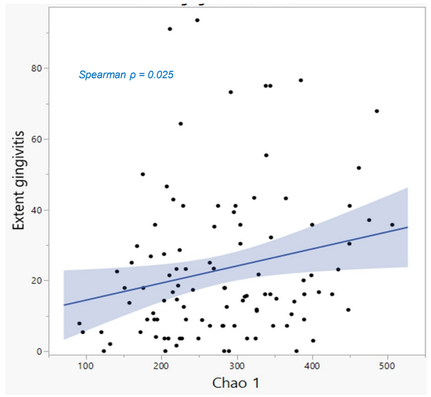


Fig. 3: Correlation gingivitis to saliva microbiome diversity (all ages).



- Microbial measures: Shannon for abundance and evenness. Chao 1 for richness.
- Shannon index or Chao 1 not correlated to age (r2=0.0001, p>0.5)

Association of oral health with lung health

Fig. 4 Correlation FEV_1 and extent of gingivitis.

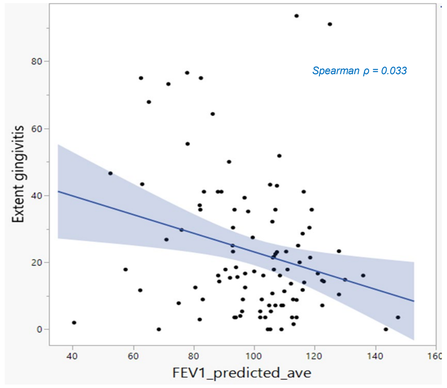
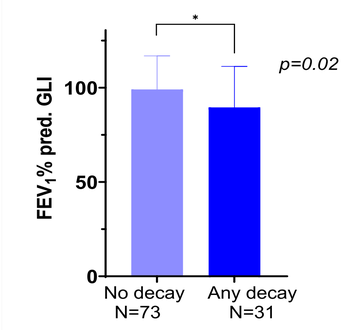


Fig. 5 Lower FEV_1 in pwCF who have dental decay.



- **Multi-variate analyses** adjusting for age, and use of acute or chronic antibiotics confirmed associations of oral health with FEV_1.
- Saliva Shannon diversity with FEV_1 : OR 7.31 (CI_{95} 1.31, 13.3)) yet for extent gingivitis only OR -0.13 (CI_{95} -0.3, 0.02).
- Presence of dental decay and FEV_1 : OR 0.96 (CI_{95} 0.93, 0.99)).

SUMMARY - DISCUSSION

- Despite overall well preserved lung disease this cohort of pwCF had substantial oral disease compared to known oral disease findings in non-CF populations.
- Higher microbial diversity in saliva was associated with better lung function in adults and with gingivitis in both adolescents and adults. Participants with worse oral health had lower lung function.
- Associations between lung function, saliva microbiome and markers of oral health may indicate the importance of oral health to pulmonary outcomes.

Grant Support:
NIH 1U01DE030418-01 (Chi/Rosenfeld)