

Latino Ethnicity Is Associated With Variations In the Nasal Microbiome In Patients With CRS

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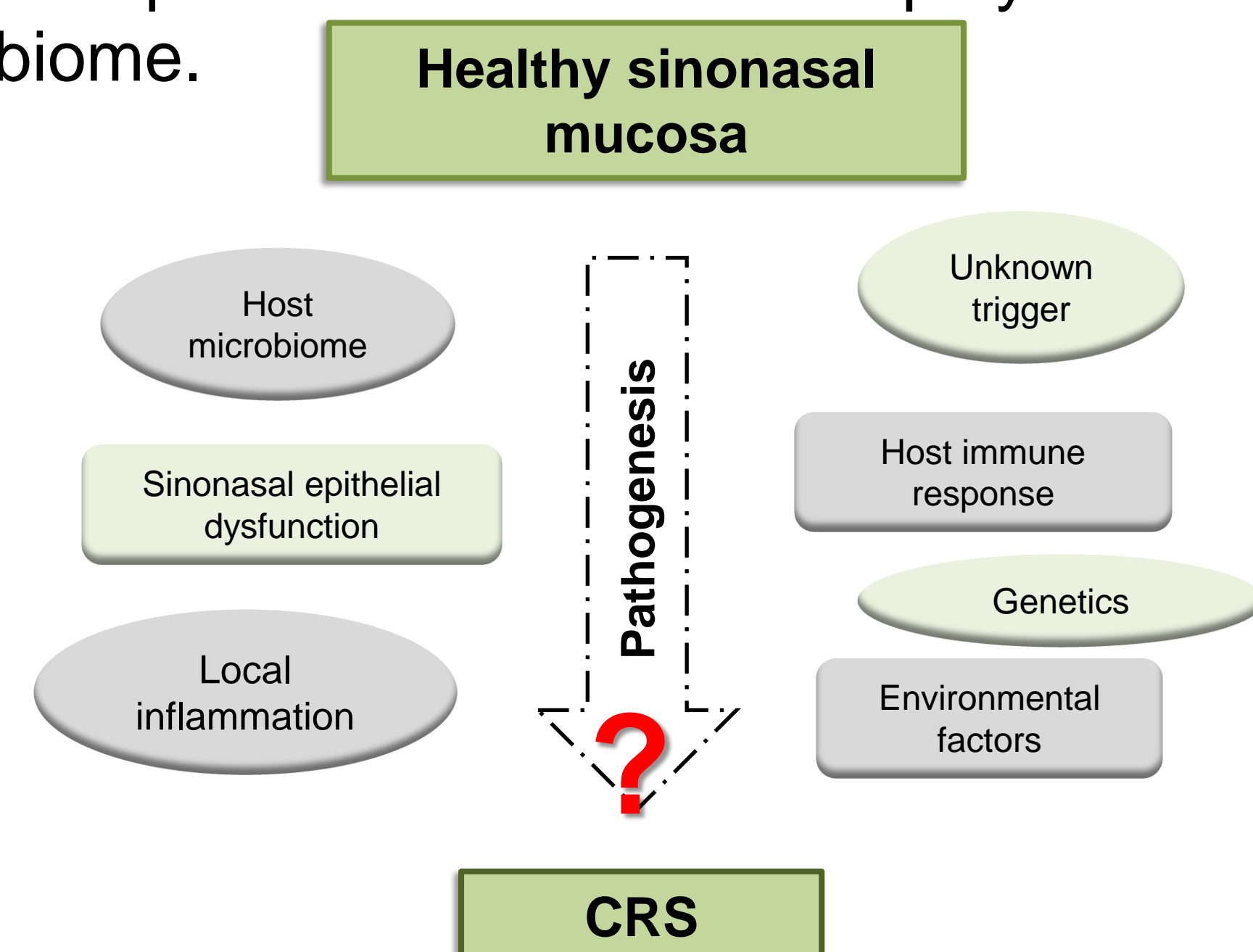
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Objective

- We aimed to determine if Latino ethnicity is associated with differences of the nasal microbiome in CRS patients after adjusting for possible confounding factors.

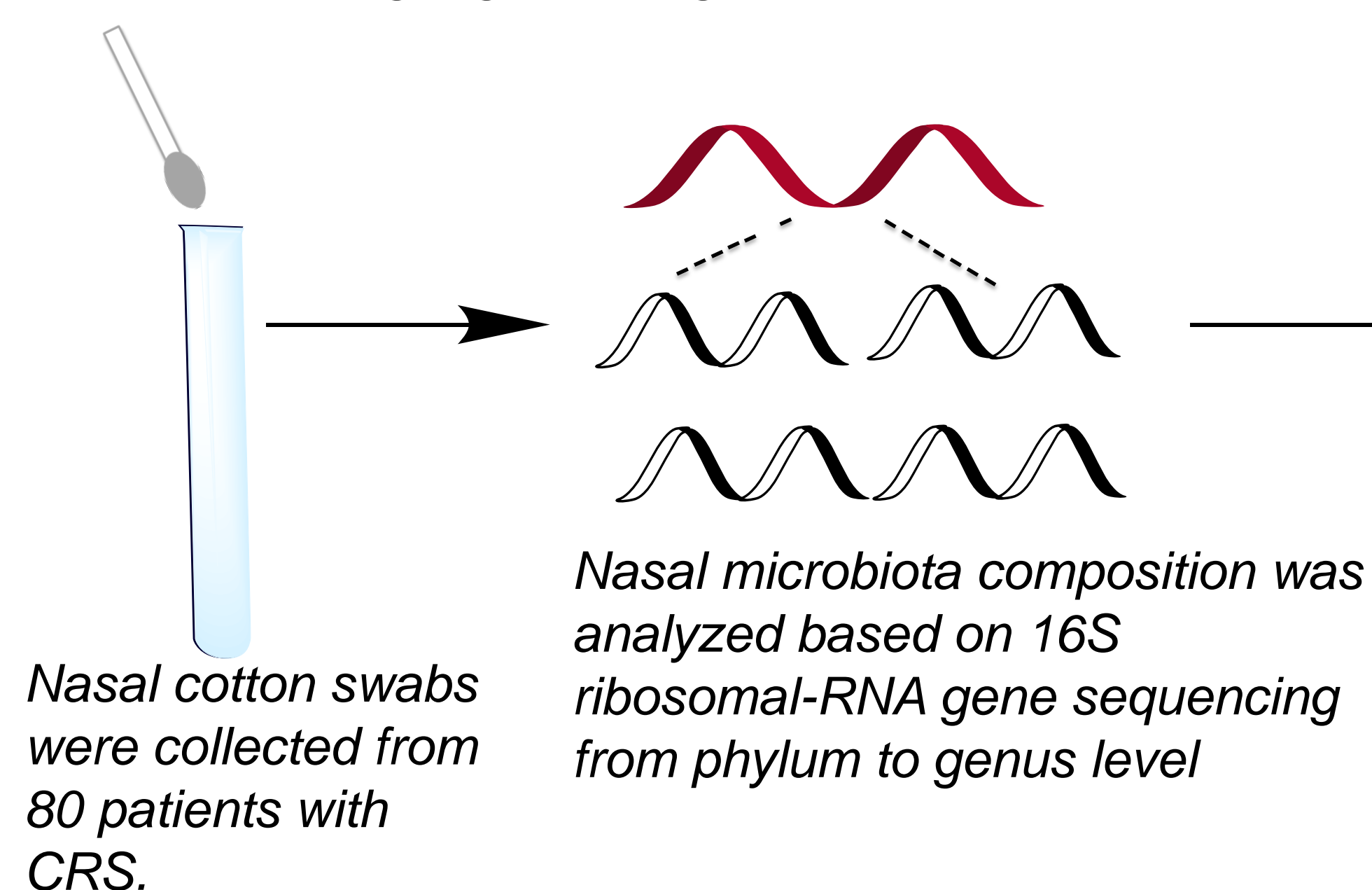
Background

- Chronic rhinosinusitis (CRS) is an inflammatory condition involving the upper airways and one of the most common chronic conditions, affecting approximately one tenth of Americans.
- Pathogenesis is poorly understood and thought to be due to a combination of host and environmental factors.
- Recent studies have shown that afflicted African Americans and Latinos have greater disease severity with worse outcome.
- More recent studies have implicated the host's microbiome with disease severity raising the question of whether race plays a role in the make-up of the nasal microbiome.



Methods

CRS diagnosis was based on duration of symptoms longer than 12 weeks and positive imaging findings



Logistic regression analysis was used to compare the relative abundance (RA) and diversity indices of microbiota between Latino and non-Latino white CRS patients, while correcting for a constructed multi-variable socio-economic index, insurance, pollution variables* (M2.5 and distance from road), age and asthma status

*Ambient particulate matter (PM) is an atmospheric aerosol. PM2.5 was obtained using data from United State Environmental Protection Agency (EPA) and the Census Bureau at the tract level. The socioeconomic indices obtained from the United States Census Bureau (5-year estimate from 2011-2015) and evaluated at the block group level included median household income, percent of individuals >16 years of age unemployed, median house value, and percent of individuals that had attained education greater than high school diploma.

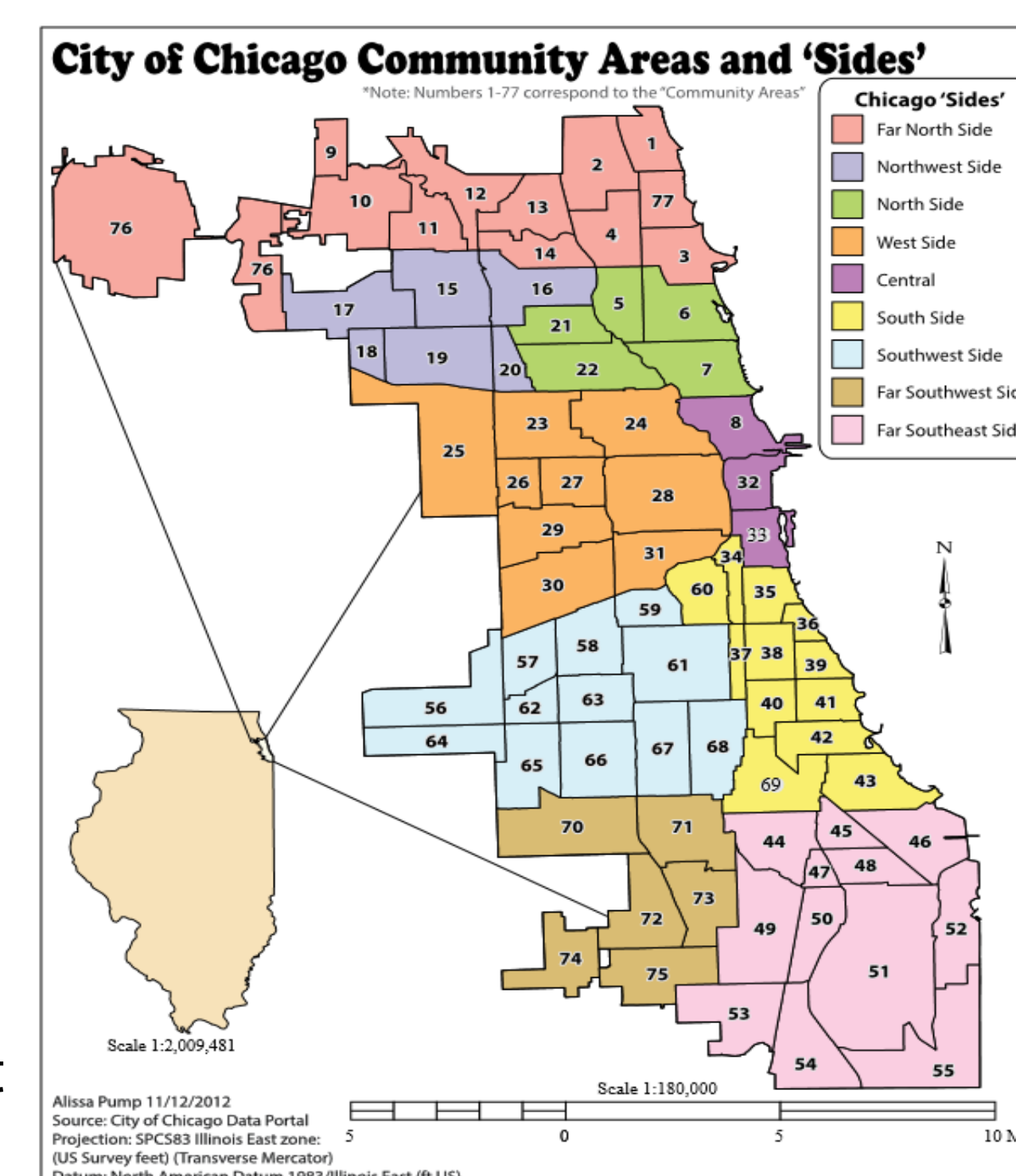
Results

80 patients with CRS were enrolled. The nasal microbiota of 14 Latinos and 66 non-Latinos were sampled and analyzed. Patients of other ethnicities and races were excluded from this study.

Variables	Odds Ratio (C.I.)	P- value
Insurance	1.2 (0.7 - 38.35)	0.912
Age	0.94 (0.9- 1.001)	0.54
Asthma	0.4(0.09-1.74)	0.22
SES index	0.0183 (0.51-2.71)	0.68
Pollution	0.085 (0.15-4.61)	0.85

Table 1: Odds ratios were calculated comparing latino and non-latino whites with CRS adjusting for demographic variables. As above there were no significant differences between latino and non-latino whites with CRS.

Markers of socioeconomic status, including median household income, median house value, percent unemployed, and percent attaining an education level above high school diploma, in each individual's block group were not significantly different between ethnicity groups. The SES index was a z score created by above 6 indices and as depicted above was not associated with ethnicity in the regression model.



Microbiota data	Odds ratio (C.I.)	P-value
Shannon diversity	0.288 (0.077-1.076)	0.044 *
Simpson diversity	0.014 (0-1.526)	0.074*
<i>Proteobacteria Burkholderia</i>	0.998 (0.997-1)	0.046 #
<i>Bacteroidetes Prevotella</i>	1.001 (0.996-1.005)	0.742
<i>Firmicutes Staphylococcus</i>	1.000 (1.000-1.000)	0.475
<i>Firmicutes Alloiooccus</i>	0.999 (0.994-1.004)	0.65
<i>Firmicutes Lactobacillus</i>	0.997 (0.969-1.026)	0.846
<i>Firmicutes Streptococcus</i>	1.001 (1 -1.002)	0.189
<i>Firmicutes Ruminococcaceae</i>	0.996 (0.98-1.013)	0.675
<i>Firmicutes Anaerococcus</i>	0.997 (0.993-1.001)	0.09
<i>Firmicutes Finegoldia</i>	0.981 (0.92-1.046)	0.556
<i>Firmicutes Peptoniphilus</i>	0.999 (0.996-1.002)	0.59
<i>Proteobacteria Haemophilus</i>	1.021 (0.988-1.055)	0.226
<i>Proteobacteria Moraxella</i>	1.008 (0.941-1.08)	0.817
<i>Proteobacteria Pseudomonas</i>	0.999 (0.998-1)	0.136
<i>Proteobacteria</i>	1.000 (0.99-1)	0.398

Table 2: Odds ratios were calculated comparing the microbiota in Latino and non-Latino whites with CRS adjusting for insurance, age, asthma, SES index and pollution

*: The nasal microbiota of Latino patients was significantly less diverse compared to non-Latino whites.

#: The relative abundance (RA) of Burkholderia genus was significantly higher in Latino patients with CRS compared to non-Latino whites with CRS.

Conclusion

- In multivariate model, Latinos with CRS were shown to have decreased diversity.
- Latino CRS cases had higher RA of Burkholderia in their nasal microbiota compared to non-Latino whites.
- Our data suggest that variations seen in the nasal microbiome of Latinos is due to possible genetic or environmental factors linked to ethnicity.
- Higher RA of Burkholderia could explain worse CRS severity seen in Latinos.

References

- Mahdavinia M, Keshavarzian A, Tobin Mc, Landay AL, Schleimer RP. A comprehensive review of the nasal microbiome in chronic rhinosinusitis (CRS). Clin Exp Allergy. 2016 46(1): 21-41
- Yang HJ, LoSavio PS, Engen PA, et al. Association of nasal microbiome and asthma control in patients with chronic rhinosinusitis. Clin Exp Allergy. 2018
- Codispoti CD, Tapke DE, LoSavio PS, Batra PS, Mahdavinia M. Living in lower income zip codes is associated with more severe chronic rhinosinusitis. Ann Allergy Asthma Immunol. 2018;120(2):207-9.
- Wang L, Cheng H, Wang D, Zhao B, Zhang J, Cheng L, et al. Airway microbiome is associated with respiratory functions and responses to ambient particulate matter exposure. Ecotoxicol Environ Saf. 2019;167:269-77.
- McCauley K, Durack J, Valladares R, Fadrosch DW, Lin DL, Calatroni A, et al. Distinct Nasal Airway Bacterial Microbiota Differentially Relate to Exacerbation in Pediatric Asthma. J Allergy Clin Immunol. 2019
- Mahdavinia M, Benhamuda M, Codispoti CD, Tobin MC, Losavio PS, Mehta A, et al. African American Patients with Chronic Rhinosinusitis Have a Distinct Phenotype of Polyposis Associated with Increased Asthma Hospitalization. J Allergy Clin Immunol Pract. 2016;4(4):658-64 e1