Cross sectional association between gut microbiota and cannabis consumption in an under-represented population of people with HIV

Donald D Porchia[1], Zhi Zhou[2], Mingkai Chen[1], Eric C Porges[3], Smita Ghare[4], Shish Barve[4], Ronald Cohen[3], Yan Wang[2], Robert Cook[2], Zhigang Li[1]

1. Department of Biostatistics, University of Florida
2. Department of Epidemiology, University of Florida
3. Department of Clinical and Health Psychology, University of Florida
4. Department of Medicine, University of Louisville

BACKGROUND

- Persons living with HIV (PLWH) often suffer from symptoms of irritable bowl syndrome (IBS) and inflammatory bowel disease (IBD)[1-2]
- The prevalence of both are higher in PLWH
- Cannabis use is increasing and is more prevalent in PLWH[3]
- Cannabis is often used as a means to manage symptoms of IBS and IBD, as well as anxiety, depression, pain and sleep disorders
- This aim of this study is to examines the associations between cannabis use and the gut microbiome

METHODS

Study Sample

- All data comes from the Marijuana Associated Planning and Long-term Effects (MAPLE) study and its supplement
- A subset of 63 study participants filled out a timeline follow back and provided a fecal sample for this cross sectional analysis
- 71% Black or Hispanic and 52% Female with a mean age of 59 years old.
- Inclusion/Exclusion Criteria: For Maple: (1) At least 18, (2) HIV positive, (3) Current Cannabis user or non-user; For Supplement: At least 60 years old with either a MoCA score greater than 26 or less than or equal to 24

Microbiome Samples

- The fecal samples were sequenced using 16S rRNA sequencing.
- Each participant contributed one sample in the analyses. After data quality check and cleaning, 253 genera were detected across the population .

Study Variables

- Average grams of cannabis per use day was converted to THC per use day. 15% THC per gram was assumed for flower users.
- Vapes, edibles and concentrates were directly recorded in mg THC. The most common percentage THC for each product was assumed.
- Cannabis use was dichotomized into High and Low groups based on median (56.25 mg) pre use day

Analysis

- Association between Alpha diversity (measured by Shannon and Chao1) and Cannabis use was analyzed using regression analysis
- Beta diversity between high and low groups was analyzed using Permanova
- Significant associations between absolute abundance and Cannabis use were analyzed using the Robust Inference for Absolute Abundance (IFAA) method

DEMOGRAPHICS AND CANNABIS USE

Demographics (All Partcipants)	level	Overall	High ≥ Median	Low < median	p-value
n		63	32	31	
Age (mean (SD))		59.35 (10.89)	54.78 (12.97)	64.06 (5.12)	<0.001
Sex (%)	Female	33 (52.4)	17 (53.1)	16 (51.6)	1
	Male	30 (47.6)	15 (46.9)	15 (48.4)	
Race/Ethnicity (%)	Hispanic	8 (12.7)	5 (15.6)	3 (9.7)	0.457
	Non-hispanic Black	37 (58.7)	20 (62.5)	17 (54.8)	
	Non-hispanic White	13 (20.6)	6 (18.8)	7 (22.6)	
	Other	5 (7.9)	1 (3.1)	4 (12.9)	
Education (%)	Did not graduate from high school	15 (23.8)	7 (21.9)	8 (25.8)	0.933
	High school diploma or equivalent	19 (30.2)	10 (31.2)	9 (29.0)	
	Some post-secondary education	29 (46.0)	15 (46.9)	14 (45.2)	
Cannabis Usage (Only Users)		Overall	High ≥ Median	Low < median	p-value
n		43	32	11	
average THC (mg) per use day (mean (SD))		92.44 (118.47)	170.98 (121.93)	11.37 (16.51)	<0.001
average THC (mg) per day (mean (SD))		74.99 (109.73)	141.25 (121.47)	6.59 (10.86)	<0.001
Number of days using per month (mean (SD))		22.28 (9.64)	23.72 (9.43)	18.09 (9.40)	0.095
Use Flower (%)	Yes	43 (100.0)	32 (100.0)	11 (100.0)	
Use Edibles (%)	No	38 (90.5)	28 (90.3)	10 (90.9)	1
	Yes	4 (9.5)	3 (9.7)	1 (9.1)	
Use Vapes or Concentrates (%)	No	39 (90.7)	28 (87.5)	11 (100.0)	0.529
	Yes	4 (9.3)	4 (12.5)	0 (0.0)	

Demographics

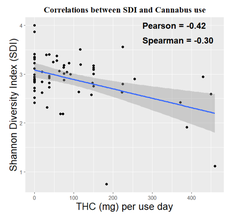
- Age was significantly different in High and Low Use groups
- There were no significant differences based on Sex

Cannabis Use

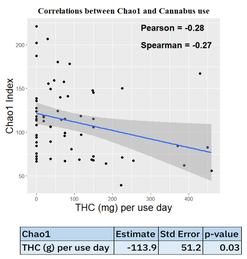
- Large difference between amount used per day and the amount use per use day
- Larger variation in the High use group than the Low group
- High group used more frequently than the Low use group
- None of the Low group used vapes or concentrates

RESULTS

Alpha Diversity

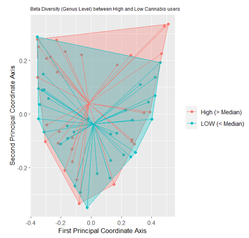


Shannon	Estimate	Std Error	p-value
THC (g) per use day	-1.23	0.58	0.038



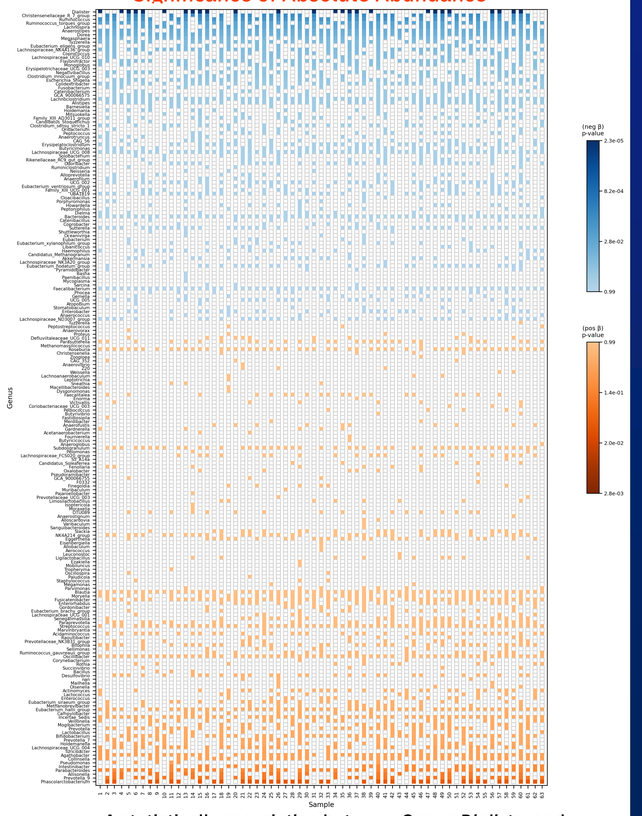
Chao1	Estimate	Std Error	p-value
THC (g) per use day	-113.9	51.2	0.03

Beta Diversity



Permanova	DF	SSE	R-squared	p-value
High/Low	1	0.219	0.0215	0.452

Significance of Absolute Abundance



- A statistically association between Genus *Dialister* and Cannabis use was found
- As Cannabis consumption increase the absolute abundance of Genus *Dialister* in the gut microbiome decreases

DISCUSSION

Overall Gut Health

- PLWH often suffer from gut dysbiosis[5], a imbalance or disruption of the gut microbiome.
- Alpha diversity is a measure of gut health
- We have seen a negative association between Cannabis use and Alpha Diversity
- This has been seen in prior research with “problematic” cannabis usage[4] as defined by CUDIT score

Gut Microbiome Composition

- Persons living with HIV (PLWH) often suffer from symptoms of irritable bowl syndrome (IBS) and inflammatory bowel disease (IBD)[1-2]
- IBS and IBD have been associated with a increase in genus *Dialister* within the gut microbiome[6]
- We found a negative association between Cannabis use and the absolute abundance of genus *Dialister* in the gut microbiome
- An association between a reduction in genus *Dialister* through fecal matter transplant and a improvement in IBS and IBD symptoms has been seen in prior research

KEY FINDINGS

- As a measure of gut health , a negative association between Cannabis use and the alpha diversity of the gut in terms of the Shannon Diversity Index (SDI) and Chao1 score
- An association between Cannabis use and the composition of the gut microbiome.
- For every 50 mg of THC consumed, there is a 11.53% decrease in the absolute abundance of genus *Dialister* in the gut microbiome

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Future Work

We propose a larger study involving a population of cannabis or CBD users and non-users, both HIV positive and negative who have symptoms of either IBS and IBD in order to investigate associate between Cannabis and CBD use with gut heath (alpha diversity) and microbiome composition

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