SINU
SOCIETÀ ITALIANA DI NUTRIZIONE UMANA

XLIV CONGRESSO NAZIONALE

SINU 2024

Piacenza, 4-6 giugno 2024

VOLUME ATTI

UNIVERSITÀ CATTOLICA DEL SACRO CUORE

un evento organizzato da | BioMedia
La condivisione del sapere

XLIV CONGRESSO NAZIONALE SINU

Stato: INVIATO - ID: 13383

Interpersonal differences in taste and flavor perception mirror gut microbial ecology and influence dietary habits

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Individual differences in taste and flavor perception significantly influences dietary choices, with emerging evidence pointing to the gastrointestinal microbiota as a contributor to such variability. However, current knowledge has focused on the oral microbiota, neglecting potential interactions between sensory perception and gut microbiota and their dietary implications.

To fill this gap, we conducted a 7-day (D1-D7) double-blind cross-sectional study with 100 healthy individuals (52% women, mean age = 23.7 ± 3.9, mean BMI = 22.5 ± 2.6). The study involved participants rating the genetically induced bitterness of 6-n-propylthiouracil (PROP) (D1), as well as their liking (D2) and the intensity of oral sensations (D4) elicited by 5 liquid and 5 solid commercial foods, each selected to evoke specific oral sensations (sweet, sour, bitter, salty, pungent). Further, the participants completed a battery of food-related psychological questionnaires (D3), a 4-day dietary record (D1–D7), and provided a stool sample for fecal microbiota profiling via 16S rRNA gene sequencing (D4).

Using a data-driven segmentation approach based on the intensity scores for the assessed foods, we identified two distinct clusters: hypo- (CL-1, n = 36, 55.5% women) and hyper-responsive (CL-2, n = 64, 50% women) to oral stimuli. CL-2 had a higher proportion of PROP Medium Tasters and exhibited more external eating behaviors. Intriguingly, CL-1 showed higher α-diversity metrics and enrichment in 11 commensal gut bacteria (e.g., genus Eubacterium xylanophilum group), while two pro-inflammatory microbial genera (Ruminococcus gnavus group, Eggerthella) were more abundant in CL-2. Moreover, CL-1 reported higher intakes of dietary fiber and plant protein, while CL-2 habitually consumed more saturated fat.

We here present the first empirical evidence suggesting that variations in sensory perception may reflect distinct gut microbial ecologies as a peripheral effect of their impact on dietary choices. This work also explores an alternative model that highlights a putative interplay between taste perception and gut microbial communities in modulating dietary habits, potentially involving bacterial lipopolysaccharides as influencers of tongue taste receptor expression.