

Adherence to Healthy Lifestyles Improves Gut Microbiota Diversity and Brain Integrity: findings from the Nutrition, GUT Microbiota, and BRain AgINg (NutBrain) project.

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Background:

The NutBrain is a cross-sectional population-based study on community-dwelling older adults (age ≥ 65 years) who lived in the Lombardy Region (Italy) between 2019 and 2023. The present work aimed at investigating how lifestyles may modulate gut microbiota diversity and composition and brain integrity, in a subgroup of 148 participants.

Methods and Results:

The gut microbiota composition and the brain integrity of the selected individuals were evaluated by 16S amplicon sequencing and brain MRI scans, respectively. A healthy lifestyle score (HLS) was computed combining adherence to a healthy diet, physical activity, smoking habits, and leisure activities engagement. In the multiple linear regression model, for each point of increase in the HLS, gut microbiota alpha-diversity (PD whole tree, $\beta=1.486$, $P=0.033$) and brain integrity (brain/CSF, $\beta=0.901$, $P=0.037$) increased independently from confounders. Furthermore, HLS positively correlates with *Barnesiella* genus and negatively with *Roseburia* genus. A positive significant correlation was found between brain integrity and *Barnesiellaceae* family.

Conclusions and Significance:

Our results suggest that adherence to a healthy lifestyle may positively shape the gut microbiota by increasing its qualitative composition and improving brain integrity in old age. Future lifestyle intervention studies targeting older people should be implemented to modulate gut microbiota and promote brain health.

Keywords:

Older adults, healthy lifestyles, gut microbiota, brain integrity, observational cross-sectional study.

References:

Prinelli F, Jesuthasan N, Severgnini M, Musicco M, Adorni F, Correa Leite ML, Crespi C and Bernini S. Exploring the relationship between Nutrition, gUT microbiota, and BRain AgINg in community-dwelling seniors: the Italian NutBrain population-based cohort study Protocol. 2020, BMC Geriatrics 20:253.

Prinelli F, Fratiglioni L, Kalpouzos G, Musicco M, Adorni F, Johansson I, Marseglia A, Xu W. Specific nutrient patterns are associated with higher structural brain integrity in dementia-free older adults. 2019, Neuroimage. 1;199:281-288.

Barichella M, Severgnini M, Cilia R, Cassani E, Bolliri C, Caronni S, Ferri V, Canello R, Ceccarani C, Faierman S, Pinelli G, De Bellis G, Zecca L, Cereda E, Consolandi C, Pezzoli G. Unraveling gut microbiota in Parkinson's disease and atypical parkinsonism. 2019, Mov Disord., 34(3), 396-405

Kleine Bardenhorst S, Cereda E, Severgnini M, Barichella M, Pezzoli G, Keshavarzian A, Desideri A, Pietrucci D, Aho VTE, Scheperjans F, Hildebrand F, Weis S, Egert M, Karch A, Vital M, RübSamen N. Gut microbiota dysbiosis in Parkinson disease: A systematic review and pooled analysis. 2023, Eur J Neurol., in press (DOI: 10.1111/ene.15671)

Mastropietro, A., Palumbo, F., Orte, S., Girolami, M., Furfari, F., Baronti, P., ... & Rizzo, G. A multi-domain ontology on healthy ageing for the characterization of older adults status and behaviour. 2021, Journal of Ambient Intelligence and Humanized Computing, 1-19.

Thematic Area:

- ~~Frontiers in Microbiome Research~~
- Microbiome: from Research to Clinics

Infrastructures:

N.A.