Article

The person-to-person transmission landscape of the gut and oral microbiomes

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Mireia Valles-Colomer[1]✉, Aitor Blanco-Míguez[1], Paolo Manghi[1], Francesco Asnicar[1], Leonard Dubois[1], Davide Golzato[1], Federica Armanini[1], Fabio Cumbo[1], Kun D. Huang[1], Serena Manara[1], Giulia Masetti[1], Federica Pinto[1], Elisa Piperni[2], Michal Punčochář[1], Liviana Ricci[1], Moreno Zolfo[1], Olivia Farrant[3], Adriana Goncalves[3], Marta Selma-Royo[1,4], Ana G. Binetti[5], Jimmy E. Becerra[6], Bei Han[7], John Lusingu[8], John Amuasi[9], Loredana Amoroso[10], Alessia Visconti[11], Claire M. Steves[11], Mario Falchi[11], Michele Filosi[1], Adrian Tett[1,12], Anna Last[3], Qian Xu[13,14], Nan Qin[13,14], Huanlong Qin[13], Jürgen May[15], Daniel Eibach[15], Maria Valeria Corrias[16], Mirco Ponzoni[16], Edoardo Pasolli[17], Tim D. Spector[11], Enrico Domenici[1,18], Maria Carmen Collado[4] & Nicola Segata[1,2]✉

The human microbiome is an integral component of the human body and a co-determinant of several health conditions[1,2]. However, the extent to which interpersonal relations shape the individual genetic makeup of the microbiome and its transmission within and across populations remains largely unknown[3,4]. Here, capitalizing on more than 9,700 human metagenomes and computational strain-level profiling, we detected extensive bacterial strain sharing across individuals (more than 10 million instances) with distinct mother-to-infant, intra-household and intra-population transmission patterns. Mother-to-infant gut microbiome transmission was considerable and stable during infancy (around 50% of the same strains among shared species (strain-sharing rate)) and remained detectable at older ages. By contrast, the transmission of the oral microbiome occurred largely horizontally and was enhanced by the duration of cohabitation. There was substantial strain sharing among cohabiting individuals, with 12% and 32% median strain-sharing rates for the gut and oral microbiomes, and time since cohabitation affected strain sharing more

RESEARCH HIGHLIGHT | 26 August 2026

Tracing the origins of babies' microbiomes

A large study of mother–infant pairs shows that the maternal gut microbiome is a major reservoir for infant gut strains, which impacts early health outcomes such as eczema.

By Karen O'Leary

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GUT DIVERSITY (GENERAL)

- The microbiome starts with transmission from the mother.
  - However, it is never 100%, closer to 50%.
- Only a handful of species are shared by everyone. Any two people share about 30%.
- Differences from mode of birth disappear by age 3.
- Food is much less important for new species than the people around us. Pets probably contribute very little.
- Single bacteria are less important than the community and the context.

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The gut microbiome as mediator between diet and its impact on immune function

Huiqing Shi[1]✉, Rob ter Horst[2], Suzanne Nielen[7], Mirjam Bloemendaal[7], Martin Jaeger[2], Irma Joosten[3], Hans Koenen[3], Leo A. B. Joosten[2], Lizanne J. S. Schweren[4], Alejandro Arias Vasquez[7], Mihai G. Netea[2,5] & Jan Buitelaar[1,6]

Dietary habits may affect inflammatory status in humans. Here we explore this interaction as well as the potential mediating role of the gut microbiome (GM), given that the GM is both involved in processing of dietary components and influences the immune system. A cross-sectional analysis of a sample of 482 healthy participants (207 males and 275 females) was performed. Dietary intake was assessed by a semiquantitative food questionnaire. Adipokines and soluble inflammatory mediators were assayed with multiple immunoassays and ELISA. Microbial DNA was extracted from frozen stool samples of 471 participants. Polychoric correlation analysis was used to establish dietary patterns, and joint multivariate associations between these dietary patterns and immune biomarkers were studied using regression analyses with adjustment for sex, age, BMI, smoking, education levels and physical exercise and other dietary patterns. Non-parametric entropy mediation was applied to investigate whether diet-immune relationships are mediated by abundance of microbial species. In this cohort, we identified three dietary patterns, characterized as "high-meat" (meat and sweetened drink), "prudent diet" (fish, fruit, legumes and vegetables) and "high alcohol" (higher alcohol consumption). Higher adherence to prudent diet was associated with a higher adiponectin level. The high alcohol pattern was associated with high concentrations of circulating concentrations of pro-inflammatory markers (CRP, IL-6, VEGF). *Dialister invisus* was found to mediate the relationship between a prudent dietary pattern and adiponectin, AAT, CRP, IL-6, and VEGF. In conclusion, a meat-based diet and a diet with high alcohol consumption were associated with high concentrations of biomarkers of chronic low-grade inflammation, and conversely, a prudent diet was associated with anti-inflammatory biomarkers. Diet-inflammation regulation may differ between sexes. Mediation analyses revealed that the association between prudent diet and immune function was partially mediated by the GM. The study adds to our understanding of the associations between diet, the immune system and the GM in a healthy population.

HEALTH AND DISEASE

- The intestinal microbiome is linked to chronic diseases ranging from IBD/IBS, Type 2 diabetes, CVD to colorectal cancer.
- The Western diet has profound effects on the diversity and populations of microbial species.
- Treatment with antibiotics in the last six months was strongly associated with microbial dysbiosis.
- Short-chain fatty acids (SCFAs) such as acetate, propionate, and butyrate suppress colonic inflammation and colon cancer development. These are produced by bacteria.

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Pathways in gut-brain communication: Evidence for distinct gut-to-brain and brain-to-gut syndromes

Philip C Keightley, Natasha A Koloski, and Nicholas J Talley View all authors and affiliations

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Abstract

Objective:

The rich interconnectedness between gut and brain is increasingly being identified. This article reviews the evidence for brain-gut and gut-brain syndromes, particularly recent epidemiological evidence, and animal studies demonstrating bi-directionality at the formative stage of development.

Method:

Narrative literature review with selection for relevance and quality.

Results:

Population surveys show a strong correlation between anxiety, depression, and functional gastrointestinal disorders, contradicting early suspicions that the high prevalence of anxiety and depression in the clinic was mainly due to neurotic health seeking behaviour. Five and 12 year follow-up shows that psychological distress can predict later onset of a functional gastrointestinal disorder and vice versa. Brain-gut pathways include the autonomic nervous system, hypothalamic-pituitary-adrenal axis including corticotrophin releasing factor directly acting on the gut. Gut-brain pathways include ascending pain pathways, cytokines including tumour necrosis factor alpha in response to bacterial translocation and inflammation, 5-hydroxytryptamine secretion by entero-endocrine cells and psychoactive chemicals of bacterial origin which

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GUT-BRAIN CONNECTION

- Abdominal pain (IBS) and autism spectrum disorder have been connected to gut dysbiosis.
- The ketogenic diet (KD) can achieve a 50% reduction in seizure rates in children's epilepsy. KD resulted in enriched populations of certain anaerobic bacteria.
- Supplementation with prebiotics or probiotics could be used to improve cognitive diseases ranging from autism to Alzheimer's and Parkinson's.

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NEWS | 05 August 2026

First poo transplant to treat food allergy in people has 'exciting' results

Existing treatments for food allergy are limited.

By Edward Chen

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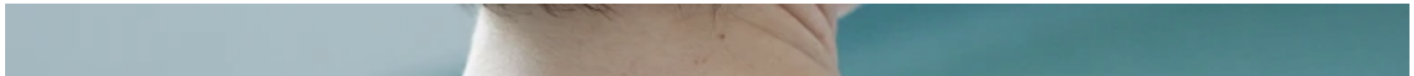

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FECAL TRANSPLANT

- Autism: reduced intestinal pain 80% and improved behavior
- C. diff.: 90% success rate. IBS: 78% success rate
- Antibiotics carry a risk of *C. difficile* infection. Risk is lowered with co-administration of probiotics.

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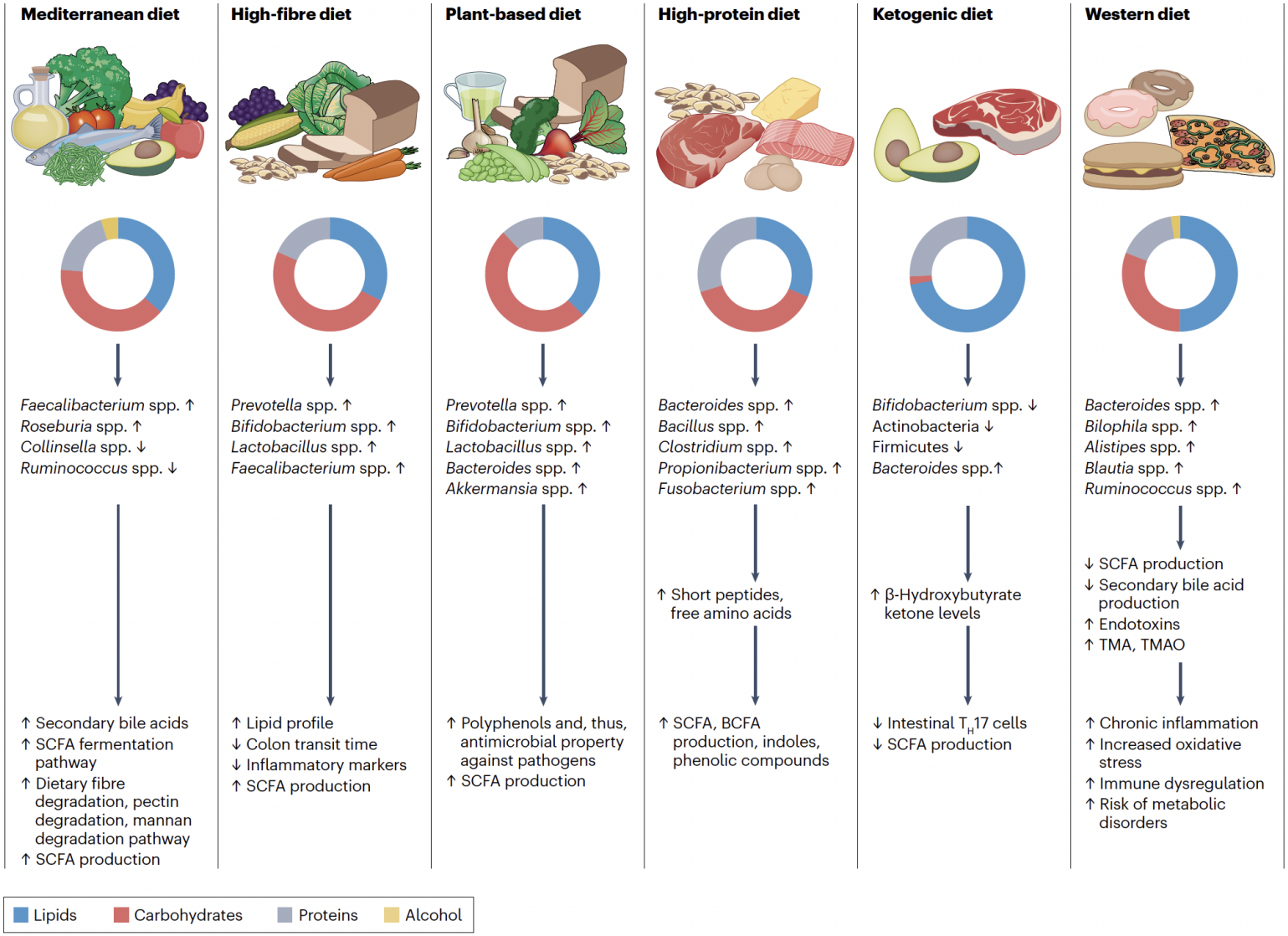

Fig. 1 | Macronutrient composition of whole diets and their effect on the gut microbiota. Each column represents a specific whole diet: Mediterranean diet, high-fibre diet, plant-based diet, high-protein diet, ketogenic diet and Western diet. Pie charts detail the distribution of macronutrients (lipids, carbohydrates and proteins) and alcohol content for each diet. The figure illustrates the alterations of bacterial taxa associated with each diet and the consequent effects on metabolite production. Upward arrows refer to an increase in bacterial taxa

a plant-based diet is associated with increased abundance of *Prevotella* and *Akkermansia* species, together with an enrichment in polyphenols and SCFA production. A high-protein diet is associated with enriched Bacteroidetes and *Fusobacterium* species, with higher production of branched-chain fatty acids (BCFAs), indoles and short peptides. The ketogenic diet is linked to decreased Firmicutes and Actinobacteria species and shows high ketone levels. A Western diet is associated with increased abundance of *Blautia* spp., *Bacteroides* spp.

THE EFFECT OF DIET

- Plant-based and Mediterranean diets shown to promote the production of beneficial bacterial metabolites, such as short-chain fatty acids (SCFAs).
  - A diet high in fiber may lengthen lifespan by reducing systemic inflammation, a result of fiber fermentation by-products.
- The Western diet is a typical example of an unhealthy nutritional approach leading to an overgrowth of pathogenic bacteria, where TMAO levels rise and SCFA production drops due to gut dysbiosis.
  - Diets rich in fats and low in fiber, such as the Western diet, are associated with increased inflammation levels

Alcohol and smoking exacerbate these problems

NUTRIENT DILUTION

- The foods of today can contain a fraction of the nutrients they once contained.
- Context is lost through extraction, but health qualities are also lost through modern rapid and efficient production systems.
- Today, we grow calories more than we grow food. We do not need more calories. We need higher quality food.

STRONG FLAVORS = SLOW MEDICINE