Factors impacting the gut microbiome

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Gut microbiota are unique to each individual. Their composition is influenced by various factors – some of which we can control, and others we can't.

Follow the links below to read key scientific articles providing supporting evidence about these influencing factors.

Antibiotics and medications

Short-term antibiotic treatment can shift the gut microbiota to long-term alternative dysbiotic states, which may promote the development and aggravation of disease:

https://www.karger.com/Article/Abstract/443360

Non-antibiotic drugs can have an extensive impact on human gut bacteria. In this study, 24% of the drugs, including members of all therapeutic classes, inhibited the growth of at least one strain *in vitro*:

https://www.ncbi.nlm.nih.gov/pubmed/29555994

Childbirth

This study suggests that children born by Caesarean section are significantly more likely to suffer from coeliac disease and to be hospitalised for gastroenteritis:

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3110651/

Conversely, this study suggests that the impact of the method of delivery on infant microbiome colonisation may have been significantly over-estimated:

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5945806/

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Diet

Gut microorganisms have been shown to play a role in a wide range of human diseases, including obesity, psoriasis, autism and mood disorders:

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5385025/

Exploring the benefits of taking an individualised approach to dietary planning:

https://www.nature.com/articles/s41575-018-0061-2

Increasing daily intake of intact cereal fibre can help support a diverse bacterial population in the gut:

https://www.frontiersin.org/articles/10.3389/fnut.2019.00033/full

A systematic review and meta-analysis supports the favourable effects of dietary fibre intervention on gut micriobiota composition in healthy adults:

https://academic.oup.com/ajcn/article/107/6/965/4994271

Prebiotic supplements might represent a targeted approach for negating possible negative effects on the gut microbiota of exclusion diets required for medical reasons:

https://onlinelibrary.wiley.com/doi/10.1111/nbu.12366

The intake of polyphenols improves the health effects of the intestinal microbiota by activating SCFA excretion, intestinal immune function, and other physiological processes:

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6359708/

Kefir is the fermented food most commonly investigated in terms of its impact in gastrointestinal health, with evidence suggesting it may be beneficial for lactose malabsorption and *H. pylori* eradication:

https://www.mdpi.com/2072-6643/11/8/1806/htm

High fat and saturated fatty acid diets can exert unfavourable effects on the gut microbiota and are associated with an unhealthy metabolic state:

https://www.clinicalnutritionjournal.com/article/S0261-5614(18)32592-5/fulltext

The role of microbial fermentation of dietary protein in diet-microbe-host interaction and why the carbohydrate requirement of the gut microbiota must also be considered:

https://www.mdpi.com/2076-2607/7/1/19

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Diet (continued)

There are concerns that artificial sweeteners might contribute to the development of metabolic derangements that lead to obesity, T2D and cardiovascular disease:

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6363527/

Gut-directed interventions, such as probiotic modulation of the intestinal microbiota, may have the potential to prevent and treat alcohol-associated pathologies:

https://www.ncbi.nlm.nih.gov/pubmed/26695747

Exercise

A review of what is known about the gut microbiota, how they are studied, and how they are influenced by exercise training and the potential mechanisms and implications for human health and disease:

https://journals.lww.com/acsm-essr/Abstract/2019/04000/Exercise_and_the_Gut_Microbiome__A_Review_of_the.4.aspx

Gut microbiota may play a key role in controlling oxidative stress and inflammatory responses, as well as improving metabolism and energy expenditure during exercise:

https://www.sciencedirect.com/science/article/pii/S2095254616300163

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Geographical region

Urbanisation and industrialisation have led to indoor-based lifestyles, consumption of refined high protein foods, improved sanitation, less exposure to soil, forest or domestic animals and habitual use of antibiotics—all having a dramatic impact on the functional role of the western microbiome:

https://www.frontiersin.org/articles/10.3389/fmicb.2017.01162/full

The robust pattern of geographical variations in gut microbial composition in humans raises some interesting points in microbial ecology:

https://royalsocietypublishing.org/doi/full/10.1098/rsbl.2013.1037

Firmicutes and bacteroidetes are the two most abundant phyla in the healthy human gut, worldwide:

https://www.researchgate.net/publication/330181500_Enterotype_Variations_of_the_Healthy_Human_Gut_Microbiome_in_Different_Geographical_Regions

Lifespan

Will we soon be able to predict the risk of developing gut dysbiosis and related illnesses in advance, and repair the microbiota to ensure a resilient and healthy microbiota for healthy aging?

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6004897/

In the past 10 years, our understanding of the composition of the adult gut microbiota has undergone significant change. We now know that the gut microbiota is complex and host-specific:

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4315782/

The most noticeable feature in the microbiota of elderly individuals is an alteration in the relative proportions of the firmicutes and the bacteroidetes. The elderly have a higher proportion of bacteroidetes while young adults have higher proportions of firmicutes:

https://www.frontiersin.org/articles/10.3389/fmicb.2014.00764/full

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Mode of feeding

In contrast to infant formulas, breast milk contains a wide variety of bioactive factors that support the development and maturation of the infant gut:

https://www.wageningenacademic.com/doi/abs/10.3920/978-90-8686-839-1_5

Meta-analyses indicate that breastfeeding protects against childhood infections and malocclusion, increases intelligence, and probably reduces obesity and diabetes:

https://www.sciencedirect.com/science/article/pii/S0140673615010247