



Dietary therapies interlinking with gut microbes toward human health: past, present, and future

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Abstract

- The global transition to a high fat and high sugar diets has influenced human health, increasing the incidence of non-communicable diseases.
- Medication is a common approach but often has adverse effects. There is increasing awareness about the benefits of dietary therapies and more unprocessed foods with functional properties are being sought.
- Emerging scientific evidence has proven the potential of using dietary therapies to promote human health including their active role in promoting a healthy gut microbiota.
- This article summarizes **recent advances in the effect of dietary pattern on gut microbes and how diet-microbiome-host interactions can be integrated using existing technologies to precisely determine the optimal personalized dietary pattern.** Conjoined prospects elicit a promising strategy for future personalized diets and nutritional intervention.

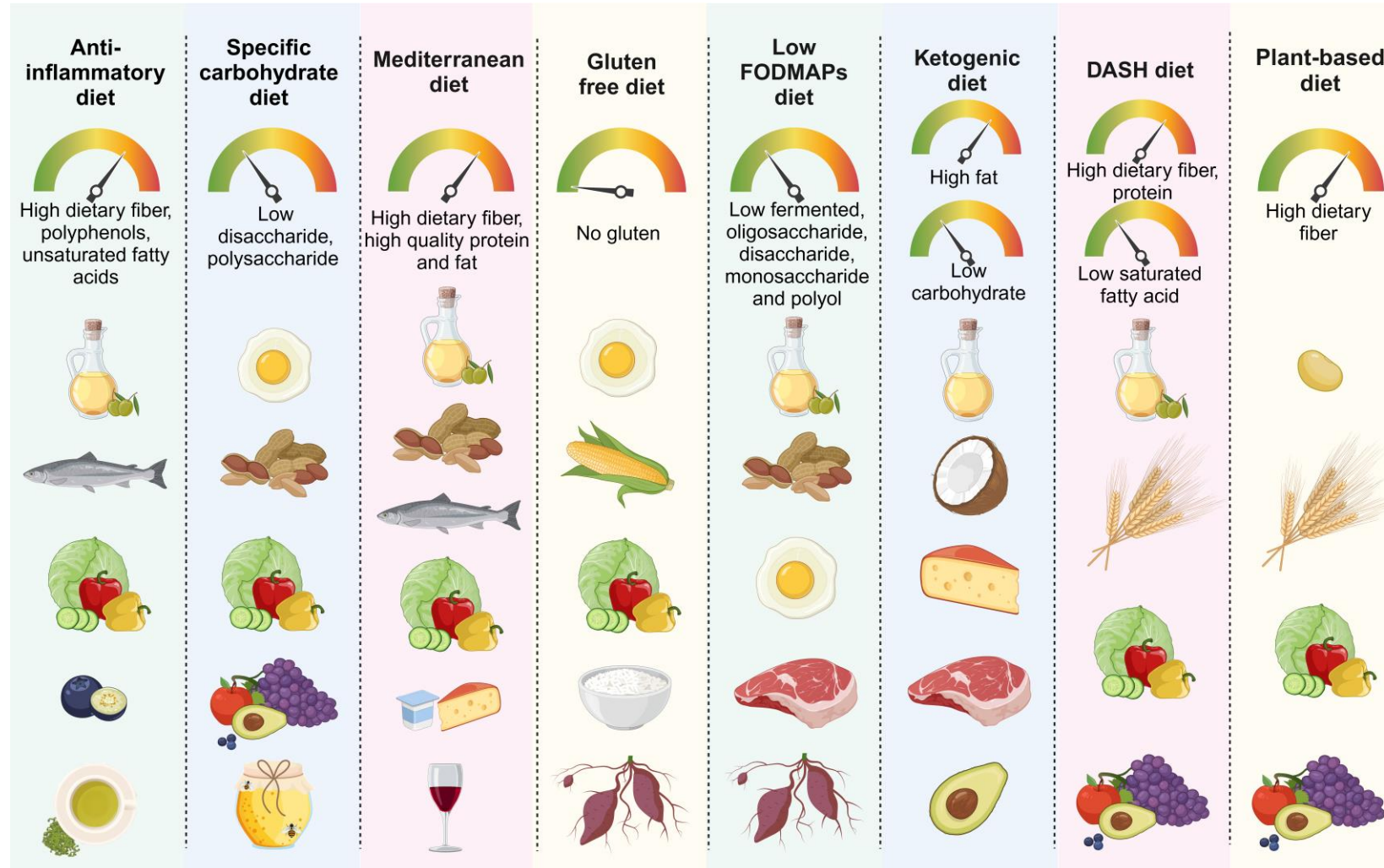


A large assortment of various snacks is displayed on a wooden surface. The snacks are arranged in several bowls and containers. There are bowls of potato chips, corn chips, and crackers. Some bowls contain nuts, like almonds and cashews. There are also bowls of various candies, including hard candies, gummy bears, and chocolate-covered treats. The snacks are presented in a variety of shapes and sizes, creating a visually appealing and diverse selection.





Correlation of dietary therapies and gut microbes: impact on human health



Anti-inflammatory diet, Mediterranean diet, DASH diet, and plant-based diet are similarly characterized with high dietary fiber. The specific carbohydrate diet is rich in food with low disaccharide and polysaccharide. Gluten-free diet is defined as being strict exclusion of gluten for life. Low FODMAPs diet is defined as food with low fermented, oligosaccharide, monosaccharide, and polyol. The ketogenic diet is characterized as low carbohydrates and high fats.

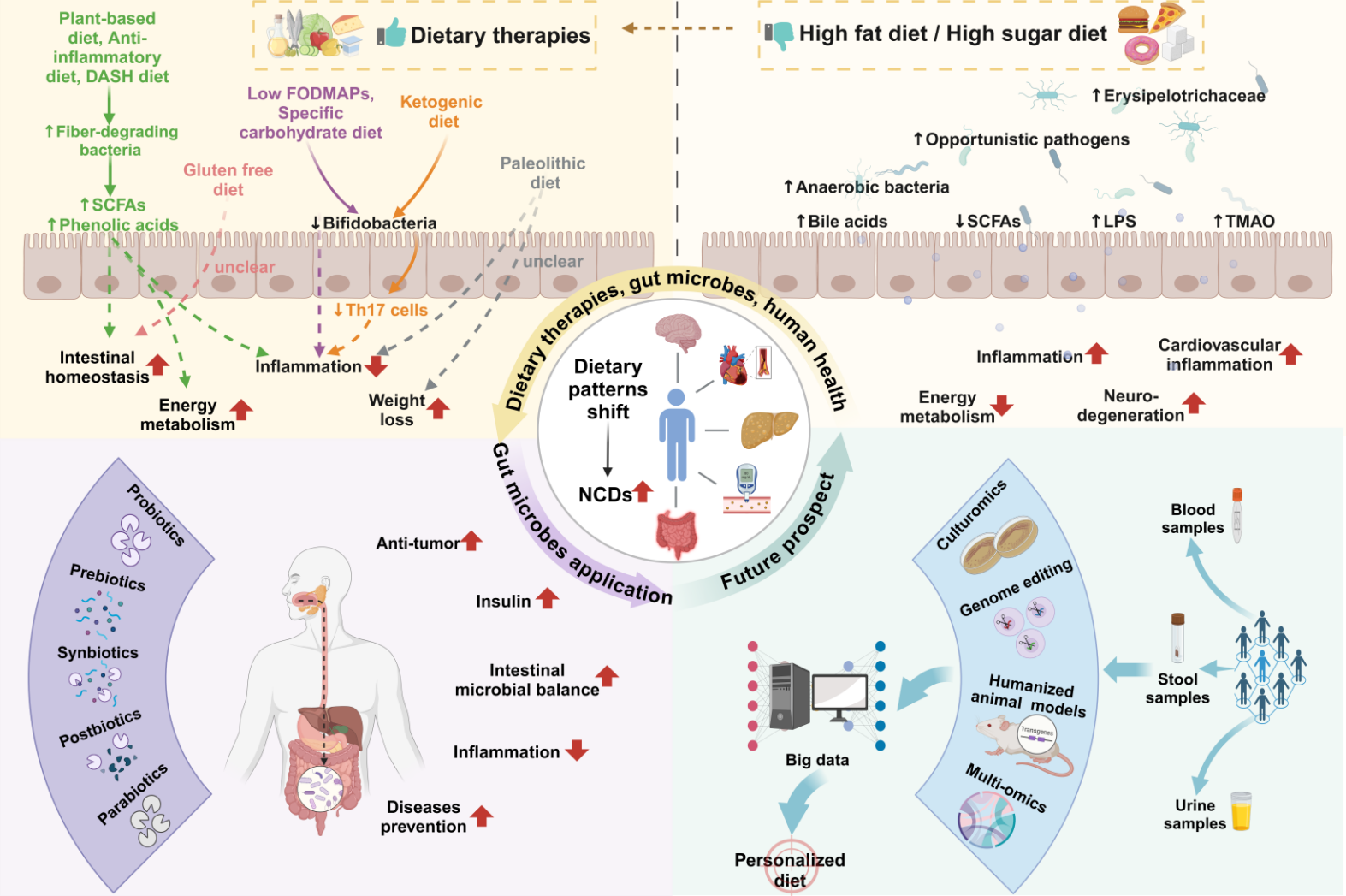


Application of gut microbes to revolutionize human health

- **Probiotics** are live microorganisms that, if ingested in sufficient amounts, can benefit the host. Probiotic interventions are able to restore intestinal microbial balances.
- **Prebiotics** are non-digestible food components that act as nutrients for gut microbes. Hydrolytic fermentation of prebiotics leads to the production of short chain fatty acids, which are beneficial to host health and have been associated with improved insulin sensitivity and reduced inflammation.
- **Synbiotics** are defined as a combination of prebiotics and probiotics, which have been shown to be effective in the prevention and treatment of metabolic diseases, irritable bowel syndrome, surgical infections, chronic kidney disease, and atopic dermatitis.
- **Postbiotics** are defined as the preparation of inanimate microorganisms and/or their components that are beneficial to the host. Antimicrobials, targeted anti-inflammatory and immunomodulatory agents, novel signaling molecules affecting intestinal pain, sensation, secretion, and motility, as well as clinical indications to enhance the efficacy of vaccinations or to modulate the immune response, may benefit from potent postbiotic metabolites.
- **Parabiotics** are inactivated microbial cells or crude cell extracts of probiotics. Different studies have described the anti-inflammatory and antioxidant potential of parabiotics.



Future exploration for establishing personalized diet and precise nutritional intervention



Using advanced technologies such as culturomics, genome editing, humanized animal and organ-on-chip models, and multi-omics, our understanding of the function of the gut microbiota can be further enhanced. Revealing the interaction between diet and gut microbiome through these techniques under different dietary interventions may provide assistance in the development of personalized diets.



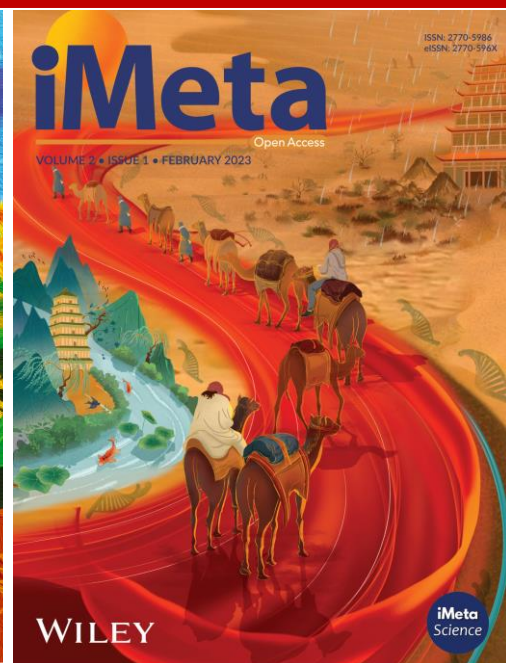
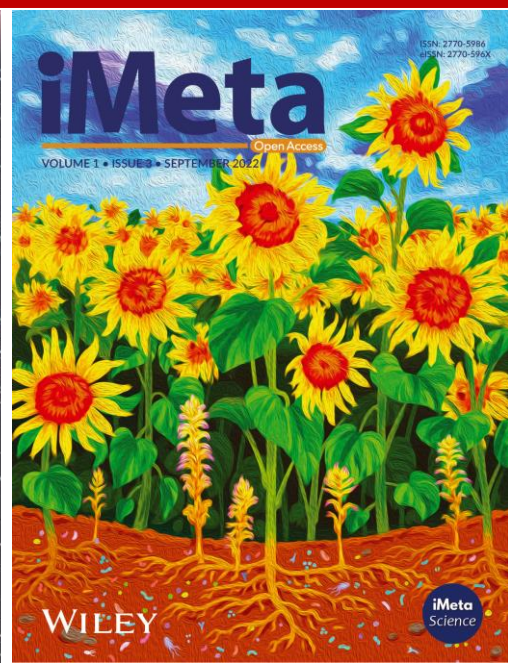
Conclusion

- ❑ The gut microbiota is the largest and most diverse microbial community among the resident microorganisms in the human body. Long-term dietary habits can impact the composition and activity of the body's gut microbes from a scientific point of view. We summarize the links between currently prevalent dietary patterns and gut microbiota, and provide recommended foods for each dietary pattern.
- ❑ We review recent advances in microecological agents and the gut microbiota.
- ❑ We believe that advancement of human microbiome and bio-medical research will revolutionize the precise personalized dietary therapies. With the development of artificial intelligence, integrating database will further prospect for personalized dietary therapies with high precision.

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