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Diet, Gut Physiology, and the Microbiota-Gut-Brain Axis

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Diet is a large influencer of the gut microbiota composition and function across the lifespan. However, information on whether and how diet can affect the brain via bidirectional communication between the gut and the central nervous system (the microbiota-gut-brain axis) is emerging. Immune, endocrine, humoral, and neural connections between the gastrointestinal tract and the central nervous system are important to this axis. The gut microbiota can produce cytokines, neurotransmitters, neuropeptides, chemokines, endocrine messengers, and microbial metabolites (e.g., short-chain fatty acids, branched chain amino acids, and peptidoglycans), some of which can enter the brain, influencing the function of brain cells. Animal studies investigating the potential of nutritional interventions on this axis have advanced our understanding of the role of diet in this bidirectional communication. This includes insights into microbial metabolites, immune, neuronal, and metabolic pathways amendable to dietary modulation. However, several aspects of the gastrointestinal tract and brain of animal models differ to humans, and it is important to consider these differences and similarities when evaluating the transability of the findings to the human context. Randomised clinical trials using dietary interventions in humans in this field are limited but have high potential application for clinical nutrition. In particular, several microbiota-targeted interventions have been explored as potential approaches for mental health. These approaches include probiotics, prebiotics, etc. as well as dietary approaches[1,2,3]. However, there are limited clinical interventions with whole-dietary approaches. Most human studies used faecal samples to infer changes in microbiota parameters occurring in the gastrointestinal tract and do not consider the physiological changes in gastrointestinal physiology (e.g., transit time) that can directly or indirectly affect the diversity and composition of the gut microbiome. Future research considerations should include better characterisation of the participants at baseline (dietary patterns, gastrointestinal phenotype, and gut microbiota composition) to identify potential responders to dietary interventions. In addition to gut microbiota assessment, evaluations of physiological parameters, brain function and behavioural measurements should be considered as part of the study protocol. In this presentation, the current state of the literature triangulating the diet, the gut microbiota, and host behaviour/brain processes will be addressed. Future research considerations will also be discussed.

References

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