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Decoding the Human Microbiome: Implications for Health, Disease, and Therapeutics

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Abstract

The human microbiome, comprising trillions of microorganisms residing in and on the human body, plays a crucial role in maintaining physiological homeostasis. Advances in molecular sequencing technologies have significantly enhanced our understanding of the complex interactions between host and microbial communities. The gut microbiome, in particular, influences metabolism, immune regulation, and protection against pathogenic organisms. Alterations in microbial composition, known as dysbiosis, have been associated with a wide range of diseases including metabolic disorders, inflammatory bowel disease, autoimmune conditions, and neuropsychiatric illnesses. Emerging evidence highlights the potential of microbiome-targeted interventions such as probiotics, prebiotics, dietary modifications, and fecal microbiota transplantation in restoring microbial balance and improving clinical outcomes. Understanding the structure and function of the human microbiome may therefore open new avenues for personalized medicine and novel therapeutic strategies. Continued research is essential to translate microbiome science into effective clinical applications and improve overall human health outcomes.

Keywords: Human Microbiome, Gut Microbiota, Dysbiosis, Probiotics, Fecal Microbiota Transplantation, Personalized Medicine