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Microbiome-microglia connections via the gut-brain axis.

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Abstract

Microglia, the resident immune cells in the brain, are essential for modulating neurogenesis, influencing synaptic remodeling, and regulating neuroinflammation by surveying the brain microenvironment. Microglial dysfunction has been implicated in the onset and progression of several neurodevelopmental and neurodegenerative diseases; however, the multitude of factors and signals influencing microglial activity have not been fully elucidated. Microglia not only respond to local signals within the brain but also receive input from the periphery, including the gastrointestinal (GI) tract. Recent preclinical findings suggest that the gut microbiome plays a pivotal role in regulating microglial maturation and function, and altered microbial community composition has been reported in neurological disorders with known microglial involvement in humans. Collectively, these findings suggest that bidirectional crosstalk between the gut and the brain may influence disease pathogenesis. Herein, we discuss recent studies showing a role for the gut microbiome in modulating microglial development and function in homeostatic and disease conditions and highlight possible future research to develop novel microbial treatments for disorders of the brain.

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