

Unlocking the Potential of the Gut-Brain Axis for Alzheimer's Disease Treatment through Probiotic Interventions: A Systematic Review

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Abstract:

Introduction: Alzheimer's disease is a common neurodegenerative disorder in the aging population leading to cognitive and memory impairment. Probiotics, living microorganisms that can promote health benefits when taken appropriately, have been claimed to be potential treatment alternatives for Alzheimer's disease amidst limited treatment options thus far. This study aimed to review the current evidence on the effects of probiotics on Alzheimer's disease in animal studies and to point to future directions for further research.

Method: The method utilized in this study followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guideline. Three reviewers searched for the articles on various databases such as PubMed, Scopus, and ScienceDirect. Articles published between 2010 and 2023 were included in the review using the keywords [Gut-brain axis], [Alzheimer], and [Probiotics].

Results: Several animal studies related to the impact of probiotics on gut microbiota, cognitive function, as well as pathological and metabolic markers in Alzheimer's disease were systematically reviewed. The result demonstrated an improvement in cognitive function after the probiotic treatment through the regulation of gut microbiota and A β deposits and inflammation suppression. In Alzheimer's disease models in mice, *Bifidobacterium breve*



HNXY26M4 and *Lactobacillus plantarum* DP189 lead to a decrease in cognitive deficits and neuroinflammation through the gut-brain axis in APP/PS1 ($p < 0.05$) and PI3K/Akt/GSK-3 β signaling pathway ($p < 0.05$) respectively.

Conclusion: Probiotics could have the potential to be safe and effective therapies for Alzheimer's disease by adjusting the gut-brain axis and decreasing pathogenic indicators. However, future studies are required to investigate optimal dosages and regimens for clinical uses.

Keywords: *Gut-brain axis, Gut microbiota, Alzheimer's disease, Probiotics*