

Effects of the Oral Ingestion of Probiotics on Brain Damage in a Transient Model of Focal Cerebral Ischemia in Mice

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What's Known

- Effects of the oral intake of probiotics on the prevention of cerebral ischemic injury are not clear.

What's New

- Oral consumption of probiotic bacteria considerably reduced brain damage in mice.
- This effect may be mediated via inhibiting the synthesis of TNF- α and oxidative stress pathway.
- Probiotics may open new therapeutic alternatives for the prevention of stroke.

Abstract

Background: Probiotics are microorganisms that may influence brain function via altering brain neurochemistry. New research evidence suggests that probiotic bacteria might protect tissue damage through diminishing the production of free radicals and/or inflammatory cytokines. Therefore, this study was designed to evaluate the effects of probiotic bacteria on the prevention or reduction of brain damage in an experimental model of stroke in mice.

Methods: In this study, 30 male BLC57 mice were randomly divided into 6 equal groups. Focal cerebral ischemia was induced via middle cerebral artery occlusion for 45 minutes, followed by 24 hours of reperfusion, in the mice. Probiotics at a concentration of 10^7 CFU/mL were administered by oral gavage daily for 14 days before ischemia. Infarct size, neurological outcome, and biochemical markers were measured 24 hours after brain ischemia. Statistical analysis were performed using the one-way ANOVA and/or Kruskal–Wallis ANOVA on rank by Sigma Stat (2.0; Jandel Scientific) software.

Results: Our results indicated that pretreatment with probiotics significantly reduced infarct size by 52% ($P=0.001$) but could not improve neurological function ($P=0.26$). Moreover, the administration of probiotics significantly decreased the malondialdehyde content ($P=0.001$) and the tumor necrosis factor-alpha level ($P=0.004$) in the ischemic brain tissue.

Conclusion: The findings of the present study showed that probiotic supplements might be useful in the prevention or attenuation of brain ischemic injury in patients at risk of stroke. Probiotics may open new therapeutic alternatives for the prevention of stroke. More preclinical and clinical studies are, however, needed to clarify their efficacy in cerebral stroke.

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Keywords • Probiotics • Focal cerebral ischemia • Tumor necrosis factor-alpha • Mice

Introduction

New evidence has revealed that gut microbacteria communicate with the central nervous system through neural, endocrine, and immune pathways and may have a direct effect on brain chemistry.¹ In this regard, there has been much evidence showing that regular feeding with the lactobacillus strain probiotics may be able to alter the expression of the receptors