

Probiotic treatment

Recent studies have highlighted the potential influence of gut dysbiosis on traumatic brain injury (TBI) outcomes. Alterations in the abundance and diversity of [Lactobacillus](#) species may affect immune [dysregulation](#), [neuroinflammatory responses](#), anxiety- and depressive-like behaviors, and neuroprotective mechanisms activated in response to TBI.

A study aims to evaluate the protective and preventive effects of Pan-probiotic (PP) treatment on the inflammatory response during both the acute and chronic phases of TBI.

Males and female mice underwent controlled cortical impact (CCI) injury or sham injury. They received a PP mixture in drinking water containing strains of *Lactobacillus plantarum*, *L. reuteri*, *L. helveticus*, *L. fermentum*, *L. rhamnosus*, *L. gasseri*, and *L. casei*. In the acute group, mice received PP or vehicle (VH) treatment for 7 weeks before TBI, continuing until 3 days post-injury (dpi). In the chronic group, treatment began 2 weeks before TBI and was extended through 35 dpi. The taxonomic microbiome profiles of fecal samples were evaluated using 16S rRNA V1-V3 sequencing analysis, and Short-chain fatty acids (SCFAs) were measured. Immunohistochemical, in situ hybridization, and histological analyses were performed to assess neuroinflammation post-TBI, while behavioral assessments were conducted to evaluate sensorimotor and cognitive functions.

The findings suggest that a 7-week PP administration induces specific microbial changes, including increased abundance of beneficial bacteria such as Lactobacillaceae, *Limosilactobacillus*, and *Lactiplantibacillus*. PP treatment reduces lesion volume and cell death at 3 dpi, elevates SCFA levels at 35 dpi, and decreases microglial activation at both time points, particularly in males. Additionally, PP treatment improved motor recovery in males and alleviated depressive-like behaviors in females.

The findings indicate that PP administration modulates [microbiome](#) composition, reduces [neuroinflammation](#), and improves motor deficits following TBI, with these effects being particularly pronounced in male mice ¹⁾.

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Holcomb M, Marshall AG, Flinn H, Lozano-Cavazos M, Soriano S, Gomez-Pinilla F, Treangen TJ, Villapol S. Probiotic treatment induces sex-dependent neuroprotection and gut microbiome shifts after traumatic brain injury. *J Neuroinflammation*. 2025 Apr 20;22(1):114. doi: 10.1186/s12974-025-03419-1. PMID: 40254574.

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