Modulation of Gamma-Aminobutyric Acid by Lactobacillus rhamnosus in Caenorhabditis elegans Modeling Alzheimer's Disease

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Alzheimer's disease (AD) affects 55 million people worldwide, leading to progressive cognitive decline, brain cell death, and brain shrinkage. Current treatments offer only limited relief, underscoring the need for innovative approaches to better understand the disease. One potential area of exploration is the gamma-aminobutyric acid (GABA) system, which plays a central role in regulating brain signaling. Another aspect is Lactobacillus rhamnosus (L. rhamnosus), a psychobiotic bacterium indicated to influence cognitive health through the gut-brain axis. This research tested the effects of L. rhamnosus on GABA levels in the genetically modified Caenorhabditis elegans (C. elegans) CL2006 strain, which models AD. We hypothesized that introducing L. rhamnosus would increase GABA abundance and provide therapeutic benefits for AD symptoms. Three groups of C. elegans were fed a diet of OP50 Escherichia coli (E. coli), L. rhamnosus, or a combination of both bacteria. After the feeding, worms were homogenized, and GABA levels were quantified using an enzyme-linked immunosorbent assay (ELISA). An ANOVA yielded a statistically significant p-value of 5.40 x 10^-11 for E. coli B vs. L. rhamnosus 2X isolated B, indicating a statistically significant increase in GABA production in L. rhamnosus compared to E. coli. The study involved no human participants or vertebrate animals, and all biologics are Biosafety Level 1 (BSL-1). This research suggests L. rhamnosus has potential as a new therapeutic target for AD and gut-brain axis research.

Awards Won: