The Role of Dietary Inulin in Mitigating Brain Injury

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Every year, millions of individuals are afflicted by mild traumatic brain injury (mTBI) in the US. mTBI causes secondary consequences in the brain and body in the form of reduced cerebral blood flow (CBF) and reduced short-chain fatty acid (SCFA) production in the gut. In addition, the gut microbiome experiences dysbiosis and harmful bacteria proliferates post-TBI in both mice and humans. These impacts may prolong brain inflammation and lower recovery outlook via the gut-brain axis. While inulin is a prebiotic known to stimulate beneficial bacterial growth in the gut, it is unknown whether supplementing inulin to mice before a mTBI would be able to provide these same benefits to the gut and the brain. To fill this gap, MRI scans and SCFA concentrations were obtained from rodent models that had previously received either an inulin-based diet or a control, cellulose-based diet before an mTBI. MRI scans were analyzed via Multi-image Analysis GUI (Mango) software to determine the CBF levels in various regions of the brain. This data, in conjunction with SCFA levels, were analyzed through unpaired t-tests for significance in the Prism software. The mice with pre-injury inulin supplementation showed significantly higher CBF in both the right hippocampus and right thalamus, and they showed significantly higher levels of the SCFA butyrate and propionate, which are responsible for reducing gut inflammation and lining leaky guts. This showed that inulin provided neuroprotective benefits and enhanced the gut integrity in the mice. These results are crucial to providing cost-effective, accessible treatment for millions of individuals at risk for mTBI.

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