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The Impact of Diet and Traumatic Brain Injury on Long-Term Neurological Health

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Traumatic Brain Injury (TBI) is a significant risk factor for the development of various neurological disorders. Even mild TBIs, such as concussions, can lead to long-term cognitive, emotional, and behavioral challenges, while moderate to severe injuries increase the risk of conditions such as dementia, Parkinson's disease, epilepsy, and Chronic Traumatic Encephalopathy (CTE). Repeated brain trauma, commonly observed in contact sports or certain occupations, further exacerbates the likelihood of developing neurodegenerative diseases. The impact of TBI on brain function can result in persistent cognitive impairments, mood disorders, and a significant decline in quality of life, highlighting the importance of monitoring and managing the effects of brain injuries. Diet plays a crucial role in both the recovery and prognosis of TBI as well as in the management of neurological disorders. Proper nutrition can significantly influence brain health by reducing inflammation, promoting neurogenesis (the growth of new neurons), and protecting the brain from oxidative stress. Diets rich in antioxidants, found in fruits, vegetables, and whole grains, have been shown to help mitigate brain damage associated with conditions such as Alzheimer's and Parkinson's disease. In contrast, High-Fat Diets (HFD) have been shown to impair the brain's ability to compensate for injury by decreasing Brain-Derived Neurotrophic Factor (BDNF) levels in the hippocampus, thereby impairing cognitive function and memory, as demonstrated in a Controlled Cortical Impact (CCI) rat model. HFD consumption has also been linked to worsened outcomes in several neurodegenerative and neurological disorders. Maintaining hydration and stable blood glucose levels is also essential for supporting brain function, as fluctuations in hydration or glucose levels can negatively affect cognitive performance. Overall, a well-balanced diet can enhance recovery from TBI and potentially reduce the risk of long-term neurological complications. Both diet and TBI are recognized as independent risk factors for neurological disorders. Understanding their individual and combined roles in brain health may improve our understanding of their contributions to the development and progression of neurological diseases.