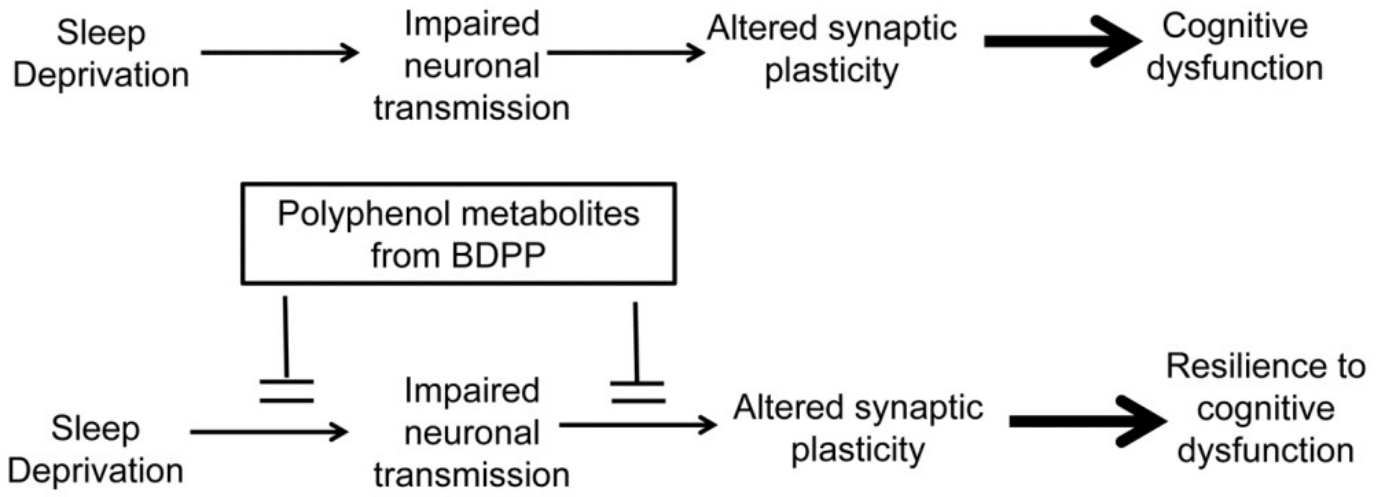
Promoting resilience to cognitive impairment associated with sleep deprivation

Chronic sleep loss is a common problem in our society; an estimated 50-70 million adults in the United States have sleep or wakefulness disorder (Institute of Medicine, 2006). Insufficient sleep is co-morbid with chronic problems such as heart disease, kidney disease, high blood pressure, diabetes, obesity, and mental illness. Sleep loss can also contribute to irritability, aggression, inattentiveness, and diminished psychomotor vigilance. The negative impacts of sleep loss on physical and mental health place a strain on our healthcare system and a large financial burden on our economy. Unfortunately, many people are unable to obtain sufficient sleep on a daily basis. Therefore, it is important to explore the molecular and cellular impacts of sleep loss in an effort to identify novel therapeutic approaches to counteract these effects.



Sleep deprivation produces deficits in brain regions such as the hippocampus, which is pivotal for memory storage. Recent evidence suggests that sleep deprivation disrupts memory consolidation through multiple mechanisms, including the regulation of certain proteins that influence brain plasticity. In this study, we tested the effects of a Bioactive Dietary Polyphenol Preparation (BDPP), comprised of grape seed polyphenol extract, Concord grape juice, and resveratrol, on the attenuation of sleep deprivation-induced cognitive impairment. We found that BDPP significantly improves sleep deprivation-induced contextual memory deficits, possibly through the mechanisms that influence electrochemical activities in the brain involved in learning and cognitive functions. Our data suggests the feasibility of using select brain-targeting polyphenol compounds derived from BDPP as potential therapeutic agents in promoting resilience against sleep deprivation-induced cognitive dysfunction (Wei et al., 2015).

Our preclinical efficacy studies further demonstrate that combination treatment of certain polyphenols derived primarily from grapes can effectively attenuate sleep deprivation-induced

cognitive impairments in mouse models. Future studies will focus on further dissecting the effects of polyphenol compounds on molecular function fundamental for learning and memory storage in the hippocampus.

Collectively, our study demonstrates that application of novel polyphenol compounds can prevent sleep deprivation-mediated cognitive impairment. Given the safety and tolerability of the compounds tested in this study, our preclinical study provides a basis for potential translational application of novel polyphenol compounds in promoting resilience to sleep deprivation-induced cognitive deficits.

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