Investigating the Link Between Visual Impairment and Ischemia-Reperfusion Injury: Potential Interventions To Mitigate Damage

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Visual impairment is linked to increased all-cause mortality and elevated risk of ischemic heart disease, but its causal relationship is unclear. This study investigated whether visual impairment or prolonged darkness could heighten the susceptibility to an ischemia-reperfusion injury and tested interventions to mitigate the damage. A homemade hypoxia chamber was used to study the impact of metformin, monoacetyldiglyceride (PLAG), exercise, and time-restricted feeding on ischemia-reperfusion injuries in Drosophila melanogaster. A custom-built plate reader, Y-maze, and imaging system facilitated resazurin assays, alcohol preference tests, and western blot analyses, respectively. The results indicated that visual impairment and prolonged darkness increased susceptibility to injury, leading to higher mortality rates. Disrupted circadian rhythms in prolonged darkness, as well as eyeless and timeless D. melanogaster, correlated with increased mortality. PLAG and time-restricted feeding demonstrated superior preventive effects on mortality, elevated phosphorylated adenosine monophosphate-activated protein kinase levels, and reduced metabolic activity post-injury. Exercise decreased mortality among the visually impaired and reduced alcohol preference after injury, while metformin increased it. Furthermore, PLAG displayed therapeutic potential compared to metformin. In conclusion, D. melanogaster with visual impairment or prolonged darkness may be more prone to ischemia-reperfusion injuries. PLAG and time-restricted diets could help prevent injury-related damage, with PLAG providing therapeutic advantages. These findings could have implications for visually impaired individuals, night shift workers, and critical situations like mining accidents and sinking ships.

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