The Modulation of Glial Cell Line-Derived Neurotrophic Factors as a Treatment for Locomotion Impairment in the SOD1 Mutant Caenorhabditis elegans Model

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The neurodegenerative disease, Amyotrophic Lateral Sclerosis (ALS), is characterized by progressive motor neuron (MN) degeneration leading to muscular atrophy (Scaricamazza et al., 2021). The loss of motor function as a result of muscular atrophy significantly decreases quality of life (Caballero-Eraso et al., 2023), and current medication, such as Riluzole, has low efficacy in improving motor control (Crescioli et al., 2022). Therefore, the purpose of the current study is to create a supplemental treatment to Riluzole to extend lifespan and motor function. Glial cell line-derived neurotrophic factors (GDNFs) can protect and regenerate MNs affected by glutamate (Cortés et al., 2017). Regulating GDNFs may prove to be valuable in understanding how to treat ALS-related muscle atrophy. Curcumin and Ginkgo Biloba are polyphenol-rich substances said to increase the production of GDNFs (Maiti & Dunbar, 2018; Lejri et al., 2019), and therefore were chosen for the treatments. C. elegans with a knock-in SOD1 gene were given one of four treatments: a) Riluzole; b) Riluzole & Curcumin; c) Riluzole & Ginkgo Biloba; d) Riluzole, Curcumin, & Ginkgo Biloba. After treatment administration, moving speed was recorded (Ikenaka et al., 2019). Results supported that the treatment group given all three solutions had the greatest increase in moving speed and the greatest final speed. This result can be attributed to Riluzole's ability to block glutamate transmission (Kretschmer et al., 1998) as well as the presence of Curcumin and Ginkgo Biloba which possibly increased GDNF levels and therefore allowed for regeneration of the cell (Zhang et al., 2009). The supplements used in this study may be applicable to other motor neuron diseases, providing hope for the future of MND treatment.

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