Schwann Cell Support as a Novel Approach to Peripheral Nervous System Demyelinating Disease: A Phase Two Study

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Peripheral nervous system (PNS) demyelinating diseases, such as Guillain-Barré syndrome, are characterized by nerve impulse conduction anomalies. These anomalies can be caused by demyelination, a degenerative process that erodes away the myelin sheath surrounding the nerve. Myelination is orchestrated by the Schwann Cell (SC), which wraps around the nerve axon and produces this myelin. Current PNS disease treatments are not focused on myelin restoration, but target only the disease symptoms and are immunosuppressive. Thus, this research addresses PNS demyelination disorders by targeting the SC myelination process. Interestingly, studies have shown that patients with demyelinating diseases have decreased levels of ascorbic acid in their blood. In addition, a Phase 1 in vitro study, demonstrated the efficacy of ascorbic acid in the remyelination process by the SC. The Phase 2 study reported here, examined the mechanism of exogenous ascorbic acid and the SC myelination process using in silico techniques on public datasets. Gene set enrichment analysis revealed ascorbic acid application rendered upregulated pathways and ontologies involved in SC extracellular matrix (ECM) production and SC-neuron signaling, critical to successful myelination. Identification of differentially expressed genes revealed a 1.7 fold change in myelin gene transcription after exogenous ascorbic acid application. Furthermore, a regression model using principal component analysis was derived, enabling prediction of PNS disease predisposition based on SC related biomarkers. This Phase 2 study suggests ascorbic acid as a potential adjunct treatment in PNS demyelinating diseases, and reveals its mechanisms, in addition to rendering a novel, non-invasive diagnostic tool.

Awards Won:
Third Award of $1,000