Targeting Signaling Pathways using Plant Polysaccharides as a Treatment for Ischemic Stroke Reperfusion.

Ischemic stroke remains a leading global health crisis, marked by high mortality rates, long-term disabilities, and inadequate treatment options. Current therapeutic strategies fail to address the financial burden and limited accessibility faced by millions worldwide. Plant-derived polysaccharides from Astragalus Membranaceus and Eleutherococcus Senticosus pose as promising treatments to target the PI3K/Akt signaling pathways, as their bioactive properties exhibit several anti-inflammatory and anti-apoptotic properties; mitigating ischemic stroke-reperfusion neurodegeneration.

This research was composed of three phases. In phase one, bioactive polysaccharides were extracted and quantified using phenol-sulfuric analysis, demonstrating: antioxidant, anti-inflammatory, and neuroprotective properties. Phase two introduced an innovative, low-cost hypoxia chamber capable of inducing ischemic stroke in Drosophila Melanogaster. This addressed the lack of accessible methods to induce ischemia-reperfusion injury in microorganisms. The hypoxia chamber was engineered to replicate hypoxic conditions through nitrogen-induced oxygen deprivation, which provided a reliable platform for studying stroke pathology. Motor function impairment in hypoxia-induced Drosophila melanogaster validated the chamber's success, as flies exhibited severe deficits in geotaxis and mobility, mimicking clinical stroke symptoms. The chambers' affordability and efficacy made it a valuable tool for resource-limited settings, enabling future research into hypoxia-related disorders.

Phase three confirmed the hypothesis that administration of these plant-derived compounds will result in improvements in motor function, upregulation of the PI3K/AKT pathway, and reduction in neurotoxicity following an ischemic attack. The polysaccharide treatment ameliorated neurodegeneration by reducing neurotoxicity, enhancing neuronal plasticity, and restoring motor function. ELISA analysis validated PI3K and Akt activation, underscoring their roles in counteracting oxidative stress and inflammation. The novel hypoxia chamber design, paired with plant-derived therapeutics, presents an advancement for ischemic stroke research and treatment through cost-effective and natural remedies.