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Translational Potential of Exosomal Phytochemicals (EPCs) in Preclinical Framework: A Next Generation Therapeutics for Multiple Sclerosis

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ABSTRACT Multiple sclerosis is a chronic inflammatory and neurodegenerative disease characterised by immune deregulation and oxidative stress. Exosomal phytochemicals have emerged as a promising curative avenue due to their anti-inflammatory and neuroprotective properties. This study examined the therapeutic potential of exosomal phytochemicals in a preclinical rat model of Multiple sclerosis by measuring their effects on inflammatory cytokines, matrix metalloproteinases, heat shock proteins, oxidative stress markers, and molecules active in Multiple sclerosis pathogenesis. A cost-effective in-silico method was developed to predict therapeutic targets, including molecular docking, protein-ligand complexes, phytochemical property analysis, drug likeness, and toxicity prediction. Five out of twenty-two high-potential phytocompounds were selected for further analysis. exosomal phytochemicals treatment significantly reduced pro-inflammatory cytokine levels, oxidative stress markers, and NADPH oxidase activity while enhancing vitamin D3 levels, indicating neuroprotective and immunomodulatory effects. Future studies should focus on molecular mechanisms and clinical validation.