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Bio Synergy Fusion: Biotech-Driven Phytomedicine Powering Multitarget Alzheimer's Therapy

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Abstract

"Alzheimer's disease, a formidable adversary impacting over half a billion lives worldwide, unfolds as a complex and unyielding molecular battlefield. In this dynamic landscape, oxidative stress, neuroinflammation, Aβ toxicity, mitochondrial dysfunction, and synaptic breakdown intertwine, relentlessly driving the progressive loss of memory and cognitive function." Current FDA-approved therapies, predominantly synthetic or semi-synthetic, offer only symptomatic relief. They are often constrained by poor pharmacokinetics, limited specificity, and adverse effects such as dizziness, gastrointestinal issues, appetite loss, and cognitive fatigue. These limitations highlight the shortcomings of the traditional one-molecule, one-target therapeutic approach. However, nature weaves a more promising narrative. Phytomedicines, abundant in polyphenols, flavonoids, alkaloids, carotenoids, and tannins, provide a multi-layered neuroprotective shield. Their combined antioxidant, anti-inflammatory, anti-apoptotic, and AChE-modulating actions work synergistically rather than in isolation. This poster enlightens the audience with the concept of bio-synergy fusion—a cutting-edge biotechnological philosophy. Here, synergistic phytochemical networks create a molecular symphony, simultaneously modulating multiple pathways associated with Alzheimer's disease. Preclinical and computational research shows that these combinations surpass individual agents by reducing Aβ burden, restoring neurotransmitter balance, enhancing mitochondrial resilience, and significantly boosting cognition. As the need for safer and more comprehensive neurotherapeutic strategies continues to rise, synergistic phytomedicine emerges not merely as an alternative, but as a genuine biotechnological breakthrough with the power to transform the future of Alzheimer's treatment.

Keywords: Alzheimer's disease, phytomedicine, synergy, biotechnology, multitarget therapy, phytoconstituents

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