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Oral Brain-Targeted Microemulsion for Enhanced Piperine Delivery in Alzheimer's Disease Therapy: In Vitro Appraisal, In Vivo Activity, and Nanotoxicity

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Abstract:

Alzheimer's disease (AD) is a neurodegenerative disorder that has no cure till now. Piperine (PIP) is an alkaloid characterized by memory-enhancing properties but challenging oral delivery obstacles. The objectives of this study are as follows: preparation of microemulsion (ME) as a proposed oral PIP nanocarrier for treatment of Alzheimer's disease and testing its safety on the brain and other internal organs. This study employs bioactive surfactants in the common safe doses to improve PIP targeting to the brain. Selected ME systems encompassed Caproyl 90 (oil)/Tween 80/Cremophor RH 40 (surfactant) and Transcutol HP (co-surfactant). The particle size of the prepared formulations was less than 150 nm with negative zeta potential. The in vivo results showed a superior effect of ME over free PIP. Colchicine-induced brain toxicity results showed the safety of ME on brain cells. Nevertheless, toxicological results showed a potential ME nephrotoxicity. Oral microemulsion increased PIP efficacy and enhanced its delivery to the brain resulting in better therapeutic outcome compared to the free drug. However, the toxicity of this nanosystem should be carefully taken into consideration on chronic use.

Reference:

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