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β-site amyloid precursor protein cleaving enzyme-1 molecular docking with ferulic acid and p-coumaric acid in Alzheimer's disease

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Abstract

Alzheimer's disease (AD) is a brain disorder that affecting a large population worldwide is characterized. This disease has no definitive treatment and imposes a great economic burden on the patients' families, and therefore, improvement of treatment methods is needed (1). β-site amyloid precursor protein-cleaving enzyme 1 (BACE1) acts as a rate-limiting step in the production of amyloid beta (Aβ) that alters the course of Alzheimer's disease (2). Abnormal activity of BACE1 in the brains of people with AD leads to the formation of beta-amyloid proteins (3). Receptor-ligand binding studies were performed using Autodock software. The ligands of ferulic acid, p-coumaric acid, and donepezil, were taken from Pubchem and converted into PDB format by AutoDock software for docking analysis. Afterward, the BACE1 protein was received from the Protein Data Bank, and after the preparation of this protein, molecular docking was done with these ligands by using the Autodock software. Finally, the obtained results were analyzed. Molecular docking shown high binding affinity for selective ligands to BACE1 enzyme. The ligands interacted with residues Asp228, Lys224, and Asp32 of BACE1, all of which fall within the active site of the enzyme, which may be critical for BACE1 inhibitory activity. This study provided evidence to consider these ligands as a valuable small molecule in the treatment and prevention of AD-related diseases, and further research in vitro and in vivo may show their therapeutic potential.

Key words: Alzheimer's disease, Ferulic acid, p-Coumaric acid, Molecular docking

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