Molecular Modeling Analysis of Atorvastatin Drug Enantiomers

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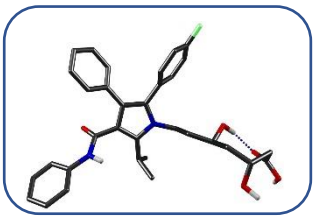
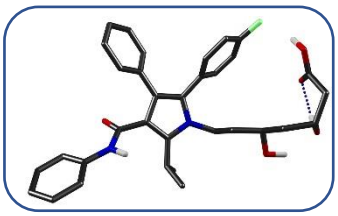
Abstract

In this work, Atorvastatin, one of the most selling drugs in the world for cardiovascular disease, was studied theoretically. Density functional theory (DFT) calculations were carried out on the four optical enantiomers (**SS**, **SR**, **RS**, **RR**) of Atorvastatin drug at B3LYP/6-31+G* level in the gas phase. The spectroscopic profiling (^{1}H and ^{13}C NMR chemical shifts) were compared with the available experimental data. Frontier molecular orbital (FMO), thermodynamic properties, the molecular electrostatic potential (MEP), total density of states (DOS) of the four enantiomers were reported, investigated. E_{HOMO}, E_{LUMO} and HOMO-LUMO energy gap (Eg; Δ), Electron affinity (A), Ionization Potential (I), the electronic chemical potential (μ), chemical hardness (η), and electrophilicity (ω) also obtained. The four enantiomers were docked into HMG-CoA reductase active site; their interactions and binding energies were reported and analyzed.



RR



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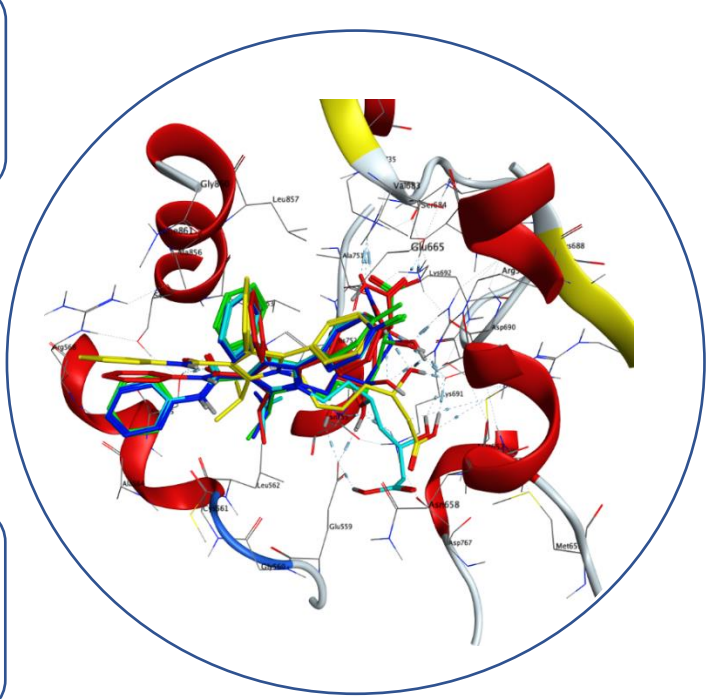
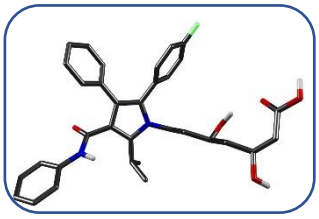
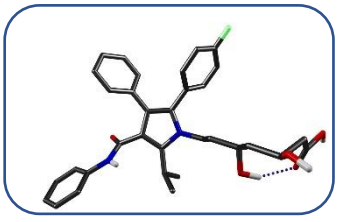




RS



SS

Keyword: Atorvastatin, DFT, Docking, electronic descriptors