Theoretical studies on the anti-inflammatory activity of hyperecin with the lipoxygenase 5 enzyme

[1]Maslov O. Yu., [2]Komisarenko M. A., [1]Kolisnyk S. V., [1]Karpova S. P.

[1]Department of General Chemistry, [2]Department of Pharmacognosy and Nutriciology,
National University of Pharmacy, Kharkiv, Ukraine
alexmaslov392@gmail.com

Lipoxygenase-5 (LOX-5) is the key enzyme involved in the synthesis of pro-inflammatory leukotrienes and has become a prime target for new drug discovery research and development efforts by the pharmaceutical and biotech industry. LOX-5 catalyzes two steps in biosynthesis of leukotrienes, a group of lipid mediators of inflammation derived from arachidonic acid. Leukotrienes antagonists are used in treatment of asthma; more recently a potential role also in atherosclerosis has raised considerable interest.

So, the aim of our study was to perform molecular docking of hyperecin with the LOX-5 enzyme. A molecular docking study was conducted using the tool known as AutoDockTools 1.5.6. Genetic algorithm parameters were applied for ligand interaction, with 10 runs of this criterion. LOX-5 (PDB ID: 2q7m) structure was obtained from PDB database. The resolution of 2q7m was 4.25 Å. The ligand structures of hyperecin (CID_3663) was obtained from PubChem database. The active site of the docking protein was identified utilizing the Computed Atlas for Surface Topography of Proteins. As a standard was taken diclofenac sodium. We applied the following classification of selectivity: inhibition concentration (IC)50<0.001 mM (high selective); 0.05>IC50>0.01 (medium selective); IC50>0.05 mM (low selective).

The hyperecin had a high value of free energy value (-11.92 kcal/mol), whereas IC50 was 0.00000182 mmol, so hyperecin belong to high selective inhibitor. Comparing result with diclofenac sodium standard, the affinity of hyperecin was 50% more than of diclofenac sodium (-6.00 kcal/mol, IC50 – 0.039882 mmol).

It was established that hyperecin is a potentially high selective inhibitor of LOX-5 enzyme. So, the extract with hyperecin can be applied for developing a new anti-inflammatory drugs.