Virtual screening of polyphenolic phytocompounds against cvir receptor protein and their biological evaluation

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Abstract

Antibiotics have been considered as a boon to mankind as it has been able to save millions of lives. However, the greatest challenge of today's era is resistant to antibiotics. Multidrug resistance seen in tuberculosis is the most common, live example of devastating effect of resistant. Multidrug resistance is said to occur most commonly by the mechanism of quorum sensing (QS), multidrug resistance genes (drug efflux pumps) and beta-lactamase (penicillin and cephalosporin). Resistance can be noted in C. violaceum mainly due to presence of such multidrug resistance genes which are under the control of QS mechanism and biofilm formation. The bacterium colony can be identified by distinct purple color due to presence of an antioxidant, non-diffusible pigment called violacein. Among the QS- controlled characteristics of this bacterium, violacein generation has attracted the attention of most of the researchers working in this area. This is an, opportunistic pathogen, which rarely cause pathogenicity but once occurs ends with high mortality rate in immune-compromised patients. The QS in C. violaceum regulates resistance to several antimicrobials, including bactobolin, tetracycline and ethidium bromide. Thus, in an attempt to find out alternative strategies to combat antimicrobial resistance we have performed, virtual screening of library of polyphenolic ligands obtained from Phenol-Explorer database against QS protein of C. violaceum. During the screening process the 2D structure of more than 500 naturally occurring polyphenols from seven different classes belonging to flavones, flavanols, lignans, stillbenes, anthocyanins, etc. found in food as enlisted in Phenol-Explorer database, were collected from ZINC database. All the ligands were minimized using molecular mechanics (MM-2) force field method, and the minimized compounds were docked inside the active site pocket of CviR (PDB ID: 3QP5) transcriptional protein of C. violaceum. Out of 756 screened ligands about 25 (-9.0 to -10.3 kcal/mol) were found to have better binding affinity than natural homo serine lactone (HSL) ligand (-8. 2 kcal/mol) of C. violaceum. We further, ranked different classes of polyphenols as per their binding affinity (-5.8 kcal/mol to -10.3 kcal/mol) with CviR target protein. ADMET studies of best docked ligands were also performed using Swiss ADMET online web server in order to analyze their pharmacokinetics and toxicity fitness scores. On the ADMET parameters 11 polyphenolic ligands found to exhibit excellently well scores in terms of solubility, bioavailability (fitness score: 0.55), Carcinogenicity and mutagenicity experiments which make these screened moieties quiet safer in terms of drug toxicity. Further, the top two compounds were evaluated for their QS inhibition and anti-biofilm activity using violacein and biofilm inhibition assay where promising results were observed as compared to standard drug. Hence, the above study helps in identification of polyphenols obtained from natural source as potential leads owing to their anti-QS and anti-biofilm activity.

Biography:

Dr. Sonam Bhatia, B. Pharma, M.S, Pharma, GATE, PhD has been working as assistant professor in department of Pharmaceutical Science sat Sam Higginbottom University of Agriculture Technology and Sciences, Prayagraj, India.

Born in small town of Rampur (UP), Dr. Bhatia attended and Graduated from Guru Nanak Dev University, Amritsar. She further qualified national level examination for pursuing her master's from institute of national importance-NIPER, SAS-Nagar, India. She received Gold medal for holding first rank during her master's program and further honored by DST INSPIRE Fellowship for pursuing her doctoral studies. Through, her constant dedication she managed to publish 20 research papers in a journal and more than 25 abstracts in conference proceedings. She is the editorial-board member of many reputed research journals and member of several pharmaceutical and health associations. She won several best paper awards and also grabbed the award of research excellence by Bristol Mayer's Squibb, Bangalore.

Speaker Publications:

1.Battle Against Coronavirus: Repurposing Old Friends (Food Borne Polyphenols) for New Enemy (COVID-19); chemrxiv; submitted on 10.04.2020, 07:18 and posted on 13.04.2020

2. In silico identification of albendazole as a quorum sensing inhibitor and its in vitro verification using CviR and LasB receptors based assay systems; pubmed/ 2018;8(3):201-209. doi: 10.15171/bi.2018.23. Epub 2018 Mar 23.

3. Synthesis, molecular docking and QSAR studies of 2, 4-disubstituted thiazoles as antimicrobial agents; japsonline/ Volume: 5, Issue: 2, February, 2015

4.Existence of dynamic tautomerism and divalent N(I) character in N-(pyridin-2-yl)thiazol-2-amine; onlinelibrary/ 22 April 2013 Volume34, Issue18/ Pages 1577-1588

5. Design, Synthesis, and Structural Analysis of Divalent N(I) Compounds and Identification of a New Electron-Donating Ligand.; europepmc/ Chemistry (Weinheim an der Bergstrasse, Germany), 30 Nov 2015, 22(3):1088-1096

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