Identification of Natural Lead Compounds against Hemagglutinin-Esterase Surface Glycoprotein in Human Coronaviruses Investigated via MD Simulation, Principal Component Analysis, Cross-Correlation, H-Bond Plot and MMGBSA

ABSTRACT

The pandemic outbreak of human coronavirus is a global health concern that affects people of all ages and genders, but there is currently still no effective, approved and potential drug against human coronavirus, as many other coronavirus vaccines have serious side effects while the development of small antiviral inhibitors has gained tremendous attention. For this research, HE was used as a therapeutic target, as the spike protein displays a high binding affinity for both host ACE2 and viral HE glycoprotein. Molecular docking, pharmacophore modelling and virtual screening of 38,000 natural compounds were employed to find out the best natural inhibitor against human coronaviruses with more efficiency and fewer side effects and further evaluated via MD simulation, PCA, DCCR and MMGBSA. The lead compound 'Calceolarioside B' was identified on the basis of pharmacophoric features which depict favorable binding (ΔGbind −37.6799 kcal/mol) with the HE(5N11) receptor that describes positive correlation movements in active site residues with better stability, a robust H-bond network, compactness and reliable ADMET properties. The Fraxinus sieboldiana Blume plant containing the Calceolarioside B compound could be used as a potential inhibitor that shows a higher efficacy and potency with fewer side effects. This research work will aid investigators in the testing and identification of chemicals that are effective and useful against human coronavirus.