Identification of Vitamin D Receptor Agonist Using Deep Recurrent Neural Network Based Virtual Screening and Molecular Docking Studies

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The Vitamin D Receptor (VDR) has recently been reported as a very promising emerging drug target for COVID-19 therapeutics, regulating various immunological functions that include the cytokine storm and responsible for generating pro-inflammatory and anti-inflammatory substances. Deep recurrent neural network-based virtual screening (DNN-VS) and molecular docking studies are conducted to investigate the possible protolerogenic action of VDR agonists. The CHEMBL1977 dataset, which contains active and inactive VDR agonists, is used as a training dataset to construct the DNN classification model. Using the resulting model, out of the 85,878 ligands obtained from different chemical databases explored by DNN-VS, 126 ligands are found to have drug-likeness properties and successfully pass ADMET toxicity analysis. Further, molecular docking studies for these ligands demonstrate that 1-cyclopentyl-4'-methyl-4,1'-bipiperidine has the highest binding affinity for the VDR binding pocket. The present findings suggest that potent VDR agonists such as 1-cyclopentyl-4'-methyl-4,1'-bipiperidine may be repurposed to regulate immunological functions and possibly reduce the severity of COVID-19 infections.