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Original article

# Computational investigations of three main drugs and their comparison with synthesized compounds as potent inhibitors of SARS-CoV-2 main protease ( $M^{PRO}$ ): DFT, QSAR, molecular docking, and in silico toxicity analysis

Ranjan K. Mohapatra <sup>a,\*</sup>, Lina Perekhoda <sup>b,\*</sup>, Mohammad Azam <sup>c,\*</sup>, Marharyta Suleiman <sup>b</sup>, Ashish K. Sarangi <sup>d,\*</sup>, Anton Semenets <sup>b</sup>, Lucia Pintilie <sup>e</sup>, **Saud I. Al-Resayes <sup>c</sup>**<sup>a</sup> Department of Chemistry, Government College of Engineering, Keonjhar, Odisha 758002, India<sup>b</sup> Department of Medicinal Chemistry, National University of Pharmacy, Pushkinska Str. 53, Kharkiv 61002, Ukraine<sup>c</sup> Department of Chemistry, College of Science, King Saud University, PO Box 2455, Riyadh 11451, Saudi Arabia<sup>d</sup> Department of Chemistry, School of Applied Sciences, Centurion University of Technology and Management, Odisha, India<sup>e</sup> Department of Synthesis of Bioactive Substances and Pharmaceutical Technologies, National Institute for Chemical & Pharmaceutical Research and Development, Bucharest, Romania

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## ABSTRACT

In this study, we examined five previously synthesized compounds and checked their binding affinity towards the SARS-CoV-2 main protease ( $M^{PRO}$ ) by molecular docking study, and compared the data with three FDA approved drugs, i.e., Remdesivir, Ivermectine and Hydroxychloroquine. In addition, we have investigated the docking study against the main protease of SARS-CoV-2 ( $M^{PRO}$ ) by using Autodock 4.2 software package. The results suggested that the investigated compounds have property to bind the active position of the protein as reported in approved drugs. Hence, further experimental studies are required. The formation of intermolecular interactions, negative values of scoring functions, free binding energy and the calculated binding constants confirmed that the studied compounds have significant affinity for the specified biotarget. These studied compounds were passed the drug-likeness criteria as suggested by calculating ADME data by SwissADME server. Moreover, the ADMET properties suggested that the investigated compounds to be orally active compounds in human. Furthermore, density functional computations (DFT) were executed by applying GAUSSIAN 09 suit program. In addition, Quantitative Structure-Activity Relationship (QSAR) was studied by applying HyperChem Professional 8.0.3 program.

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## 1. Introduction

The appearance of highly transmitted pathogen SARS-CoV-2 has given birth to the pandemic COVID-19, causing anxiety among the people, and has significantly influenced the global econ-

omy (Mohapatra et al., 2020a, 2020b). The unwanted COVID-19 outbreak driven by this highly infectious virus SARS-CoV-2 has spread its tentacles over the entire world and has taken millions of people under its cover (Lipsitch et al., 2020; Mohapatra and Rahman, 2020). Everyday huge number of people loses their lives due to this deadly disease. The number of infected patients is spiraling exponentially despite adequate measures taken by the respective governments. Besides, there is a social stigma attached to the disease too. The household where any member contracts the disease gets ostracized by the neighbors. This outbreak has overturned the normal living of human being worldwide and turned on the most critical universal health disaster of this century due to cross country transmission. (Almendros, 2020; Tiwari et al., 2020). As a preventive measure, people are forced to use masks, gloves, sanitizers, tissue papers during their daily activities

\* Corresponding authors.

E-mail addresses: [ranjank\\_mohapatra@yahoo.com](mailto:ranjank_mohapatra@yahoo.com) (R.K. Mohapatra), [linaperekhoda@ukr.net](mailto:linaperekhoda@ukr.net) (L. Perekhoda), [azam\\_res@yahoo.com](mailto:azam_res@yahoo.com), [mhashim@ksu.edu.sa](mailto:mhashim@ksu.edu.sa) (M. Azam), [ashishsbp\\_2008@yahoo.com](mailto:ashishsbp_2008@yahoo.com) (A.K. Sarangi).

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