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Docking Studies of Thiazole-Indole-Isoxazole Derivatives as Anticancer Agents

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ABSTRACT Molecular docking studies of a new library of amide derivatives of thiazole-indole-isoxazole **1a, 1b,** and **1c** were performed against the cancer targets, STAT2 SH2 domain and B helix DNA dodecamer shown significant binding affinity.

KEYWORDS Panobinostat, Dasatinib, Indole, Thiazole and docking studies.

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INTRODUCTION

Breast cancer remains a pressing global health concern, necessitating the exploration of innovative treatment strategies. This research article aimed to provide a comprehensive synthesis and evaluation of newly developed indole-derived compounds with thiazole and isoxazole moieties as potential anticancer agents against breast cancer. To gain deeper insights into the mechanism of action and potential therapeutic applications of these compounds, molecular docking studies were conducted. Docking studies have emerged as a valuable tool in drug discovery and development, allowing researchers to predict the binding interactions between small molecules and target proteins or nucleic acids. By simulating the molecular docking process, we can elucidate the potential modes of interaction between the synthesized compounds and specific biomolecules involved in breast cancer progression, such as the STAT3 protein and DNA. The utilization of docking studies in this research serves multiple purposes. First, it enables us to assess the binding affinity and stability of the synthesized compounds with the target biomolecules. By analyzing the binding poses and interaction energies, we can identify the key structural features and functional groups that contribute to enhanced binding and potential inhibitory effects.

In addition, through docking studies, we can investigate the potential of the synthesized compounds as allosteric inhibitors or modulators of the target proteins. Allosteric regulation plays a vital role in cellular processes and offers opportunities for designing selective and efficacious therapeutic agents. By integrating the results from molecular docking studies with the *in vitro* evaluation of anticancer activity and toxicity profiles, a more comprehensive understanding of the synthesized compounds' potential as therapeutic agents against breast cancer can be achieved.

In this manuscript, we present the synthesis of a series of indole-based compounds and the systematic evaluation of their anticancer activity against breast cancer cell lines. We also discuss the absorption, distribution, metabolism, and excretion (ADME) properties and drug-like characteristics of these compounds, with their toxicity profiles. In recent years, new drug molecules have been developed for the treatment of breast cancer.[1-5] The analogs of alkaloids in which the imidazole,[6,7] ring of the alkaloid was replaced by other five-membered heterocycles with thiazoles,[8-12] isoxazoles,[13,14] and their derivatives. They also exhibit a broad spectrum of biological activities,[15-17] including antituberculosis,[18,19] antiviral,[20] anticancer activities,[21-24] antibacterial,[25] antioxidant,[26] antihypertensive,[27] and antimicrobial.[28] The indole derivatives also exhibit a

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