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Original Research Article

Click Chemistry-Based Synthesis of Novel 1,2,3-Triazole Derivatives and Cytotoxic Activity on Breast and Prostate Cancer Cell Lines

Hamsa H. Al-hujaj[1], Faeza A. Almashal[1]*, Aqeel T. Kadum[2], Mohammed K. Mohammed[1], Kawkab Ali Hussein[1], Ahmed M. Jassem[1]

[1]*Department of Chemistry, College of Education for Pure Sciences, University of Basrah, Basrah, Iraq*
[2]*The General Company for the Petrochemical Industry, Basrah, Iraq*

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ABSTRACT

Breast and prostate cancers are a major cause of death each year. Most available anticancer drugs are not very effective and can cause side effects. Identifying a safe and effective alternative drug with fewer side effects for long-term anticancer therapy is therefore necessary. The present study was aimed at synthesizing 1,2,3-triazole derivatives and evaluating their activity against human breast cancer (MCF-7) and prostate cancer (PC-3) cell lines. Novel series of three 1,2,3-triazole derivatives (T_1, T_2, and T_3 compounds) were synthesized. The compounds were produced by the Cu(I)-catalyzed Huisgen 1,3-dipolar cycloaddition process. They were subsequently subjected to IR, H-NMR, and ESI-MS spectroscopic analyses. An *in vitro* cytotoxicity assay was conducted on each newly synthesized compound against MCF-7 and PC-3 cells. The results showed that most of the T_1, T_2, and T_3 test compounds exhibited significant cytotoxic action. The principal derivatives T_1 and T_2 are the compounds with the most promising cytotoxic activity. Furthermore, when compared to the standard 5-FU drug, the IC_{50} values for the compounds T_1, T_2, and T_3 against the PC-3 cell line were 273.947, 406.305, and 314.368 M, respectively, while they were 91.476, 132.658, and 116.232 against breast cancer cells when compared to the standard drug adriamycin. The findings of this study demonstrated that the novel synthesized compounds could be used as potential anticancer drugs.

Keywords: 1,2,3-triazole, Anticancer, Breast cancer, Click chemistry, Prostate cancer.

Introduction

Breast and prostate cancers are prevalent malignancies that claim many lives each year. In recent years, many anticancer drugs have been developed. However, most of the anticancer drugs developed are not very effective, and side effects may occur at the same time as drug-induced impedance. Therefore, it is necessary to discover a safe and effective alternative drug with fewer side effects for long-term anticancer therapy.[1,2] The basic building block of many medicinal drugs is 1,2,3-triazole (Figure 1), and these analogs have attracted interest in medicinal and pharmaceutical chemistry. Researchers are interested in lead compounds made of 1,2,3-triazoles with heterocycles because they have a variety of biological properties, including being antimicrobial, antibacterial, anticancer, antituberculosis, antiviral, anticonvulsant, anti-inflammatory, analgesic, and anti-HIV.[3-11]
,2,3-triazoles as heterocyclic compounds with excellent yield, and this reaction is valuable because azides and alkynes are simple to assemble into a single structure. The wide range of copper (I) and azide-alkyne catalyzed cycloaddition (CuAAC) (Scheme 1) is demonstrated by its use in various fields of material and life sciences, such as drug discovery,[12] DNA labeling,[13] and oligonucleotide synthesis.[14]

*Corresponding author. E-mail: faeza.ameer@uobasrah.edu.iq
Tel: 009647717283167

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The click reaction of azido derivatives and alkynes can easily form 1 Recently, various synthetic methods have been reported for the synthesis of triazole scaffolds, demonstrating advancements in click chemistry. The click reaction is crucial for numerous processes, including the synthesis of 1,2,3-triazole scaffolds, chemical crosslinking, and polymer grafting, according to reviews.
The aim of the present study was to synthesize 1,2,3-triazole derivatives and evaluate their cytotoxic activity against the MCF-7 breast cancer cell line and PC-3 prostate cancer cells.

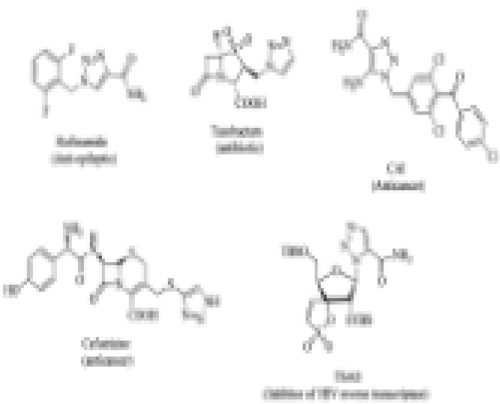

Figure 1: 1,2,3-triazole-containing drugs.