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REVIEW ARTICLE

# EXPLORING UTILITY OF PYRAZINE-BASED HETEROCYCLIC COMPOUNDS IN ANTICANCER DRUG DEVELOPMENT

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**Cancer is witnessing a rising global incidence, affecting a predominant proportion of the populace. In response, ongoing endeavors are underway to develop novel anticancer pharmaceuticals, with their safety profiles currently undergoing evaluation. Among these, pyrazine-based medications constitute a significant contribution, representing a pivotal pharmacophore prevalent in both synthetic and natural heterocyclic compounds. Characterized by a six-membered aromatic heterocycle with two nitrogen atoms, pyrazine exhibits versatile therapeutic applications in drug development, offering myriad prospects for the refinement of future anticancer agents through targeted interactions with pivotal receptors. Pyrazine compounds, through their inherent structural attributes, have demonstrated efficacy in inhibiting enzymes, receptors, and various other targets implicated in cancer pathogenesis. Contemporary research endeavors are centered on the synthesis of novel pyrazine derivatives tailored for cancer treatment, often in combination with other molecular moieties. Consequently, this review expounds upon the recent therapeutic advancements in pyrazine-based drugs, providing insights into their synthetic pathways, marketed drugs elucidating their primary targets, and a compendium of recently patented and published research papers. This collective information serves as a valuable resource for scientists engaged in the formulation of efficacious medications endowed with the requisite pharmacological activity.**

**Key words:** Heterocyclic compounds, Cancer, Pyrazine-based drugs, Anticancer pharmaceuticals.

## INTRODUCTION

Pyrazine is an azaheterocycle that is aromatic and contains two nitrogen atoms. Specifically, pyrazine is a diazine and is isomeric with pyrimidine and pyridazine. Pyrazine is an electron-deficient molecule because of the presence of two electronegative N-atoms which withdraws electron density from the aromatic ring. Pyrazine derivatives are well-known in natural products and are reported to have medicinal and biological significance. In the laboratory, it was first synthesized in 1876 [1]. Pyrazine is an important pharmacophore since it constitutes the integral scaffold in several types of drugs. Although literature is enriched with reports of cytotoxic potential of heterocyclic and other aromatic compounds [2, 3], but due to the wide bio-spectrum of pyrazine derivatives, this motif is present in anti-inflammatory, anticancer, antidiabetic, and diuretic drugs [4].

Furthermore, pyrazine derivatives are also reported to possess high antimicrobial activities [5]. In addition to the importance of pyrazine derivatives in the pharmaceutical sector, these molecules have immense commercial importance in flavor [6], fragrance [7], and food industries [8]. Pyrazine, a naturally occurring