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Review Article

A review on the chemistry and pharmacological properties of benzodiazepine motifs in drug design

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Abstract

Benzodiazepines are an important class of heterocyclic compounds in organic chemistry. They are known for their diverse physicochemical and biological properties. Some benzodiazepine derivates are well-known drugs with diverse and strong pharmacophoric moiety. An immense number of pharmacological research on benzodiazepine heterocycles and their derivatives have recently been conducted to explore its numerous pharmacological potentials as better therapeutic candidates for the treatment of various disorders, benzodiazepines, however, are one of the main sources of interest for many medicinal chemists. Researchers are drawn to the benzodiazepine nucleus for the synthesis of new drugs because of its potent pharmacophoric moiety and ring shape. Due to the emergence of new pathogenic strains' resistance to the presently available drugs, there has been a constant demand for more effective and selective drugs. Benzodiazepine moiety has all the desired qualities for selective drug candidates used as useful therapeutic agents. Given the

importance of benzodiazepine moiety, the current review aims to assess benzodiazepine syntheses as well as their pharmacological properties for potential molecular targets in therapeutic development.

Keywords:

- Benzodiazepines
- biological properties
- pharmacophoric agents
- therapeutic drug
- microwave irradiation

1. Introduction

Heterocyclic compounds are essential group of medicinal compounds with more than half of the well-known organic medications contained this template (Ajani et al., Citation2019). Because of its significance in the study of pharmacological variety in medicinal chemistry and organic synthesis, it may be claimed that the world is currently in the phase of heterocyclic chemistry (Ajani et al., Citation2019). The foundation of planetary and human existence is heterocyclic chemistry which is a large subset of organic compounds with a diversity of biological functions (Balaban, Oniciu, & Katritzky, Citation2004). For the quantification and confirmation of biologically active heterocyclic based medicines, spectrophotometric analysis has been recognized as the essential toolbox (Azmi et al., Citation2013; Azmi, Al-Fazari, Al-Badael, & Al-Mahrazi, Citation2015; Azmi, Al-Hadhrami, Al-Marhoubi, Al-Sulaimi, & Al-Shamoosi, Citation2017). For instance, imipramine hydrochloride, a benzodiazepine bioisostere, has just been validated in tablet as solid material by the use of spectrophotometric determination (Azmi et al., Citation2022). Additionally, the detection of doxepin hydrochloride in commercial dosage forms as well as the identification of piroxicam in commercial dosage forms have both been effectively accomplished using the spectrofluorimetric approach (Azmi, Iqbal, Jaboob, Al Shahari, & Rahman, Citation2009; Rahman, Siddiqui, & Azmi, Citation2009). In order to conclude all investigations and acquire a suitable specification to ensure the level of purity of drug substances and drug products, a proposed method of profiling drug impurity has been made (Rahman, Azmi, & Wu, Citation2006).

Benzodiazepine, a potent pharmacophore of crucial biodiversity for drug discovery, is the heterocyclic molecule of focus in this study. The psychoactive substance benzodiazepine, **1** and its derivatives are bicyclic heterocyclic compounds having a benzene ring fused to a seven-membered ring. The diazepine ring has two nitrogen atoms at various places in the ring (Shorter, Citation2005). Regardless of where the nitrogen atoms are located, benzodiazepines are numbered from the position next to the carbocyclic ring. Hoffmann-La Roche discovered the first benzodiazepine in 1955, and Librium, its brand name, was introduced to consumers in 1960 (Wicy, Citation2013). Benzodiazepine motifs are found in trace amount in Carod plants (*Ceratonia siliqua*) and are used as anxiolytics, hypnotics and as chemo-anticipatory

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