Chapter 1
Chemistry and Pharmacological Applications of 1,3-Oxazoles

Saurabh Chetia
https://orcid.org/0009-0000-1208-8511
Mizoram University, India

Lalremruati
Mizoram University, India

Brilliant N. Marak
Mizoram University, India

Ved Prakash Singh
Mizoram University, India

ABSTRACT

Oxazoles, a class of five-membered aromatic heterocycles containing nitrogen and oxygen atoms, are of significant importance across various fields, including medicine and agriculture. Renowned for their diverse biological activities, including antibacterial, antiviral, anticancer, and anti-inflammatory properties, oxazoles have garnered significant attention in research. This chapter offers a comprehensive overview of the chemical properties, synthesis methods, and reactivity of oxazoles, alongside their pharmacological applications. It covers both conventional and forefront synthetic pathways of oxazole and its derivatives. The reactivity section explores the unique behavior of oxazoles in cycloadditions, reductions, and nucleophilic and electro-

DOI: 10.4018/979-8-3693-7267-8.ch001

philic substitution reactions. Additionally, the chapter highlights the occurrence of oxazole derivatives in natural products and their potential medicinal applications.

1. INTRODUCTION

5-membered aromatic heterocycles rings have remarkable implications in research related to pharmaceuticals (Rusu et al., 2023) and agriculture (S. Wang et al., 2024). Oxazole is one of the remarkable heterocycles that contain nitrogen and oxygen, which serve as a building block for many highly functional and unique products. The first oxazole was synthesized in 1840 by Zinin, who named the compound azobenzil. This was achieved through the reaction of benzil with alcoholic ammonia (Wiley, 1945). The study of oxazole chemistry commenced in 1876 with the synthesis of 2-methylbenzoxazole (Cornforth & Cornforth, 1947), whereas the synthesis of the parent oxazole was achieved in 1962. Compounds containing oxazoles have been associated with a wide range of biological activities, such as antibacterial(Wales et al., 2015), anti-allergic, anticonvulsant(Song & Deng, 2018), anticancer (Chiacchio et al., 2020), anthelmintic(Laohapaisan et al., 2023), antiviral, depressive, analgesic(Kumar & Singh, 2021), and antioxidant qualities(Putri & Cahyana, 2022). Synthetic Oxazole compounds have good anti-inflammation potential(Kean, 2004), anti-HIV(Deng et al., 2022), antitubercular (Giddens et al., 2005) and TRPV1 antagonist action (Perner et al., 2010a) activities, making them essential in the pharmacological research portfolio. Oxazoles are also utilized in the polymer industries (Grotkopp et al., 2011; Min et al., 2007; Zhao et al., 2009), photography (Turchi & Dewar, 1975), and as fluorescent dyes, agrochemicals, and corrosion inhibitors (El Ibrahimi & Guo, 2021; Tang & Verkade, 1996). This chapter summarizes the recent developments in the synthesis of physiologically active molecules based on oxazoles.

1.2 General Properties of Oxazoles

Oxazoles (Figure 1) are numbered starting from oxygen and numbered around the ring. They are double unsaturated heterocyclic organic molecules featuring an oxygen and nitrogen atom at the 1st and 3rd positions, separated by carbon in between with the chemical formula C_3H_3NO.

Virtual Screening of Phyto Chemicals Against SARS-CoV-2 Targets: Spike, RdRp, and Proteases

Shahanas Naisam, Vidhya V. S., Suvanish Kumarand Nidhin Sreekumar (2021). *International Journal of Quantitative Structure-Property Relationships (pp. 61-76).*
www.irma-international.org/article/virtual-screening-of-phyto-chemicals-against-sars-cov-2-targets/282503