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Review

A Review of Approaches to the Metallic and Non-Metallic Synthesis of Benzimidazole (BnZ) and Their Derivatives for Biological Efficacy

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Abstract: Heterocyclic compounds are significant lead drug candidates based on their various structure–activity relationships (SAR), and their use in pharmaceutics is constantly developing. Benzimidazole (BnZ) is synthesized by a condensation reaction between benzene and imidazole. The BnZ structure consists of two nitrogen atoms embedded in a five-membered imide ring which is fused with a benzene ring. This review examines the conventional and green synthesis of metallic and non-metallic BnZ and their derivatives, which have several potential SARs, along with a wide range of pharmacological properties, including anti-cancer, anti-inflammatory, anti-microbial, anti-tubercular, and anti-protozoal properties. These compounds have been proven by pharmacological investigations to be efficient against different strains of microbes. Therefore, in this review, the structural variations of BnZ are listed along with various applications, predominantly related to their biological activities.

Keywords: benzimidazole; heterocyclic derivatives; biological activity

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1. Introduction

With regard to BnZ's limiting efficacy and its extensive advantageous reactive properties for quantitative and qualitative relations, BnZ derivatives have remarkable beneficial components due to their diverse bioactivity and therapeutic uses [1]. Due to the importance of BnZ, it was decided to synthesize a number of novel BnZ-based derivatives with additional heteroatoms and investigate their probable bioactivity. BnZ exhibits a significant electron-rich heterocyclic pharmacophore in its structure which is beneficial for drug design and development [2]. Investigation of the melting point (m.p.) of several BnZ derivatives showed that addition of a substituent to 1-position leads to a reduction in m.p. The presence of two nitrogen atoms in the imide group generally causes polarity, resulting in its solubility in organic solvents and greater solubility in polar solvents. The solubility in non-polar solvents may improve with the addition of non-polar substituents to the BnZ ring in various positions. In contrast, the addition of polar groups to BnZ causes it to

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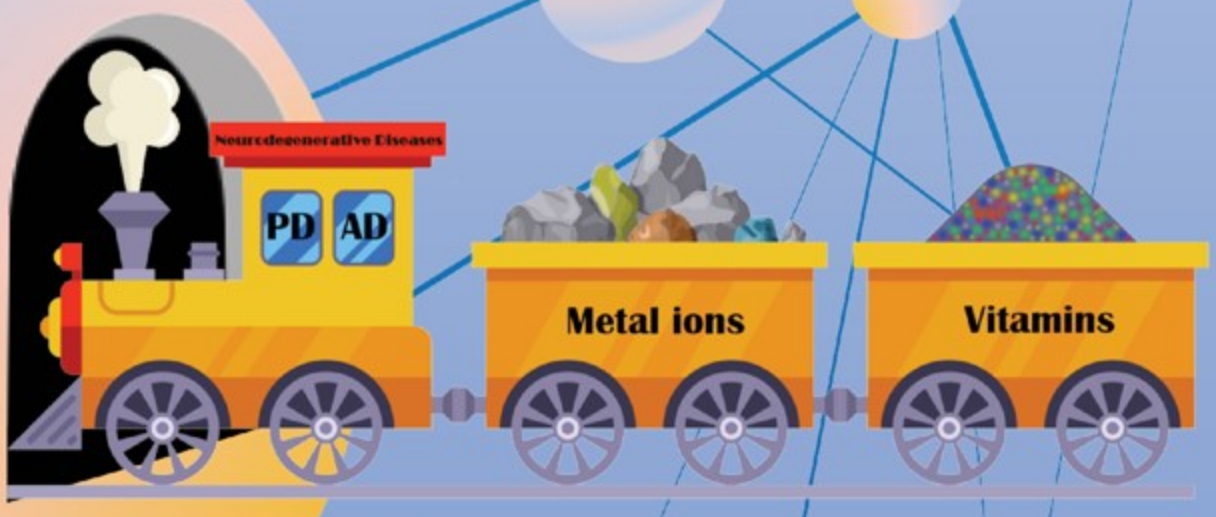

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