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Advances in Boron-based Drugs in Medicinal Chemistry

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INTRODUCTION

Boron compounds have been shown to form diverse bonds with biological targets. Currently, many boron-based drugs (such as bortezomib, crisabolol, and tavabolol) are FDA-approved and in clinical use, and several other boron-containing compounds are in clinical trials. Due to their abundant biological activities and useful pharmacokinetic profiles, boron-based heterocyclic have incredible potential in the ongoing search for new therapeutic agents. The present perspective aims to provide an overview of the published pharmacological applications of boron-based heterocyclic. We categorized these compounds into groups with common pharmacological activity, focusing primarily on the most potent therapeutic compounds and describing their corresponding biological targets. Boron's unique electron depletion and coordination properties have led to a wide range of applications in chemistry, energy research, materials science, and life sciences. The use of boron-containing compounds as active pharmaceutical ingredients has a long history, and recent developments have provided promising advances.

DESCRIPTION

Boron agents have been used in both radiotherapy and chemotherapy. Boron agents play an important role in such treatments, and other established areas are discussed elsewhere. Besides tumor treatment with BNCT technology, organoboron compounds used to treat various diseases also mark important milestones. Following the clinical introduction of bortezomib as an anticancer agent, the benzoxabolol drugs tavabolol and crisabolol were approved for clinical use in the treatment of onychomycosis and atopic dermatitis. Several heterocyclic organoboron compounds represent potentially promising anti-infective candidates. In this review article, clinical applications of organoboron compounds containing natural boron atoms in the treatment of diseases without neutron irradiation are discussed. The main topics are tuberculosis and antifungal activity, alaria, neglected tropical diseases, and therapeutic applications of organoboron compounds in the diseases of cryptosporidiosis and toxoplasmosis. Advances in boron chemistry have expanded the use of this element in medicinal chemistry. Boron-containing compounds are a new class for medicinal chemists to use in the design of pharmaceuticals. A dipeptide boronic acid approved by the FDA for the treatment of multiple myeloma, paved the way for the discovery of new boron-containing compounds. That approval was followed by two of his other boron-containing compounds, tavabolol for the treatment of onycholysis and crisabolol for the treatment of mild to moderate atopic dermatitis. Many boron-containing compounds have been described and evaluated for various therapeutic uses. The purpose of this review is to highlight recent advances in boron-containing compounds and their therapeutic applications. Here we focus only on the most biologically active compounds with proven *in vitro* and/or *in vivo* efficacy in the therapeutic field recently published.

CONCLUSION

Advances in boron chemistry have expanded the use of boron from material applications to medical applications. Boron-based agents have multiple uses, including use as contrast agents for optical and nuclear imaging, and as therapeutic agents with anticancer, antiviral, antibacterial, antifungal, and other disease-specific activities. For example, bortezomib, the only boron-based drug in clinical use, was approved as a proteasome inhibitor for the treatment of multiple myeloma and non-Hodgkin's lymphoma. Several other boron-based compounds are in various stages of clinical trials, demonstrating the potential of this approach for medicinal chemists working in the boron field.

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