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Mini Review

A MEDICAL CHEMIST'S SURVIVAL GUIDE

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ABSTRACT

The majority of drugs work by interacting with chiral counterparts, such as proteins, and unfortunately, we are well aware of how chirality can affect how a treatment works. Preparing chiral, non-racemic drugs in a safe, cost-effective, and sustainable manner is becoming increasingly important as the number of these drugs on the market grows. Although asymmetric organ catalysis has a long history, it did not begin its renaissance until the early. The award of the Chemistry Nobel Prize demonstrates that this field has progressed to an extraordinary level since that time. The use of organ catalysis in the synthesis of enation-enriched molecules, which October be of interest to the pharmaceutical industry and the medicinal chemistry community, is the focus of this review.

Keywords: Silk fibroin; Beta-sheet; Crystalline structure; Biomedical engineering

INTRODUCTION

The various activation modes that have been observed for organ catalysts will be discussed, along with the generally accepted mechanisms and the most significant and developed reactions, in an effort to provide medicinal chemists with useful information. During the synthesis of drugs and natural products, specific examples from academic and industrial settings will be presented for each of these kinds of organ catalytic activations. The majority of prescribed drugs interact with a chiral biochemical counterpart because of its spatially defined three-dimensional shape. As a result, this method of recognition is extremely stereospecific. From the hit-discovery phase to the fine-tuning of the manufacturing process, this one simple word has had a significant impact on all aspects of the present-day drug discovery process. Although the notorious thalidomide case was related to the chirality and stereo specificity of the drug–biological counterpart interaction, pharmacopoeias were still dominated by racemic drugs until the Regulatory Agencies began to set some guidelines for the commercialization of chiral drugs in the late. The Food and Drug Administration's document titled "Development of new stereo isomeric drugs, which proves particularly difficult, the main pharmacologic activities of the isomers should be compared in in vitro systems, in animals, and/or in humans," was crucial in this setting. The pharmaceutical industry has reached a dead-end with this. In point of fact, the decade-long report indicates that 108 of the 195 new molecular entities approved by the FDA were single enantiomers. Importantly, the development of suitable

technological platforms that made it possible to synthesize and/or separate a particular chiral compound in large quantities, as well as identify the chiral compounds, made this significant shift possible. Resolution of racemates synthesis from the chiral pool and synthesis from prochiral substrates are the three main methods for preparing enantiopure compounds.

DISCUSSION

The chiral information is primarily transferred from an enantiopure catalyst to a non-chiral compound in the latter scenario. A novel type of catalysis known as asymmetric organ catalysis has emerged as a striking and unanticipated development among the various catalysts for this transformation over the past two decades. The chemical industry confirmed this outbreak and made every effort to bring it to the public's attention. No covalent organ catalysis in contrast to covalent organ catalysis was primarily developed through H-bond and Barnstead acid catalysis. Despite their role as a structural determinant, H-bonds initiate the acceleration of numerous biochemical reactions, which is crucial. This principle is utilized by numerous enzymes including serine proteases, type II aldoses, and others, to activate a specific substrate. Before the seminal papers by Jacobsen and Corey, which independently reported an asymmetric Striker reaction using H-bonding organ catalysts, electrophilic activation by chiral small-molecule H-bond donors emerged as a significant paradigm for enantioselective catalysis. The catalytic activity of Jacobsen's reaction can be attributed to the thiourea's capacity to effectively engage the imine for nucleophilic attack via double H-bonding, while the high enantioselectivity is due to the significant steric effect of the amide portion of the catalyst, according to mechanistic studies [1-3].

The ability of H-bond donors to catalyze useful organic transformations has enabled the discovery of a remarkable number of novel enantioselective reactions and the creation of novel catalyst frameworks over the past two decades. Diols and thioureas have been used the most frequently as H-bonding catalysts. In particular, thiourea-based catalysts have demonstrated excellent reaction performance in promoting Henry, Mukaiyama–Mannich, and other highly enantioselective cyanosilation reactions. Since its discovery to the Nobel Prize's global recognition, asymmetric organ catalysis has undergone a sensational development over the past two decades. For the purpose of synthesizing enantiopure molecules, this development has elevated this method to the same level as enzymatic and metal catalysis. As a consequence of this, the general interest in asymmetric organ catalysis has progressed beyond the development of merely methodologies to a much more applied field, such as its use as a crucial step in the synthesis of various molecules that are relevant to medicinal chemistry or have biological activity. In point of fact, medicinal chemists find this approach very appealing due to a number of its advantages, including the absence of metal contaminants, its ease of use, the availability of catalysts, and the possibility of a wide range of possible reactions [4-6].

CONCLUSION

There are numerous ways to activate organic molecules, as this review explains, and numerous organ catalytic reactions have been developed. In parallel, there has been a steady increase in the number of academic and industrial applications of organ catalysis in the synthesis of drugs, drug candidates, and natural products. Because we only touched on a small portion of the published research, we strongly believe that medicinal chemists will increasingly use

asymmetric organ catalysis in the coming years to gain access to enantiopure molecules in a cost-effective, environmentally friendly way. Numerous advancements in organ catalysis, which will further expand the range of applications for this remarkable method, will support and facilitate this procedure.

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