

Advances in Organic Synthesis



Editor:
Shazia Anjum

Bentham Books

Advances in Organic Synthesis

Volume # 18

Editor: Shazia Anjum

ISSN (Online): 2212-408X

ISSN (Print): 1574-0870

ISBN (Online): 978-981-5040-79-1

ISBN (Print): 978-981-5040-80-7

ISBN (Paperback): 978-981-5040-81-4

© 2023, Bentham Books imprint.

Published by Bentham Science Publishers Pte. Ltd. Singapore. All Rights Reserved.



CONTENTS

PREFACE	i
LIST OF CONTRIBUTORS	ii
CHAPTER 1 RECENT SYNTHETIC AND BIOLOGICAL ADVANCES IN ANTI-CANCER FERROCENE-ANALOGUES AND HYBRIDS	1
<i>Vishu Mehra and Isha Lumb</i>	
1. INTRODUCTION	1
FERROCENE-BASED CONJUGATES HAVE ANTIPROLIFERATIVE POTENTIAL	3
CONCLUDING REMARKS	35
REFERENCES	36
CHAPTER 2 SYNTHESIS OF FUSED NITROGENATED HETEROCYCLES: INTRAMOLECULAR POVAROV REACTION	40
<i>Carne Masdeu, Jesus M. de los Santos, Francisco Palacios and Concepcion Alonso</i>	
1. INTRODUCTION	40
2. SYNTHESIS OF TRICYCLIC FUSED HETEROCYCLES	45
2.1. Formation of the Acridine Skeleton	45
2.2. Formation of Quinoline Derivatives Fused with Carbo- and Heterocycles	50
3. SYNTHESIS OF TETRACYCLIC FUSED HETEROCYCLES	54
3.1. Formation of Quinolines Fused with Carbocycles	54
3.2. Formation of Quinolines Fused with Nitrogen-Containing Heterocycles	57
3.3. Formation of Quinolines Fused with Heterocycles Containing Oxygen or Sulfur Atoms	63
3.4. Formation of Naphthyridines Fused with Heterocycles Containing Nitrogen Atoms	71
3.5. Formation of Naphthyridines Fused with Heterocycles Containing Oxygen Atoms	73
3.6. Formation of other Tetracyclic Heterocycles	74
4. SYNTHESIS OF PENTACYCLIC FUSED HETEROCYCLES	78
4.1. Formation of Quinolines Fused with Carbocycles	78
4.2. Formation of Quinolines Fused with Heterocycles Containing Nitrogen Atoms	79
4.3. Formation of Quinolines Fused with Heterocycles Containing Oxygen Atoms	86
4.4. Formation of Quinolines Fused with Heterocycles Containing Nitrogen and Oxygen Atoms	88
4.5. Formation of Quinolines Fused with Heterocycles Containing Nitrogen and Sulfur Atoms	92
4.6. Formation of other Pentacyclic Heterocycles	92
5. SYNTHESIS OF HEXA- HEPTA- AND OCTACYCLIC FUSED HETEROCYCLES	94
CONCLUDING REMARKS	99
ACKNOWLEDGEMENTS	100
LIST OF ABBREVIATIONS	100
REFERENCES	101
CHAPTER 3 USE OF BARBITURIC ACID AS A PRECURSOR FOR THE SYNTHESIS OF BIOACTIVE COMPOUND	112
<i>Sundaram Singh and Savita Kumari</i>	
INTRODUCTION	113
SYNTHESIS AND PHYSICAL PROPERTIES OF BARBITURIC ACID	115
Synthesis of Barbituric Acid	115
Physical Properties of Barbituric Acid	117
<i>Tautomerization and Acid-Base Properties</i>	117
Chemical Properties	119
<i>Reactions at the C-5 Position</i>	119



CHAPTER 1

Recent Synthetic and Biological Advances in Anti-cancer Ferrocene-Analogues and Hybrids

Vishu Mehra^{2*} and Isha Lumb¹

¹ Department of Chemistry, Baring Union Christian College, Batala-143505, India

² Department of Chemistry, Hindu College, Amritsar-143005, India

Abstract: Cancer is among the most severe risks to the global human population. The enduring crisis of drug-resistant cancer and the limited selectivity of anticancer drugs are significant roadblocks to its control and eradication, requiring the identification of new anticancer entities. The stable aromatic nature, reversible redox properties, and low toxicity of ferrocene revolutionized medicinal organometallic chemistry, providing us with bioferrocene compounds with excellent antiproliferative potential, which has been the focus of persistent efforts in recent years. Substituting the aryl/heteroaryl core for ferrocene in an organic molecule alters its molecular characteristics, including solubility, hydro-/lipophilicity, as well as bioactivities. Ferrocifen (ferrocene analogues of hydroxytamoxifen) has shown antiproliferative potential in both hormone-dependent (MCF-7) and hormone-independent (MDA-MB-231) breast cancer cells. It is now in pre-clinical trials against malignancies. These entities operate through various targets, some of which have been revealed and activated in response to product concentrations. They also react to the cancer cells by diverse mechanisms that can work in concert or in isolation, depending on signaling pathways that promote senescence or death. The behavior of ferrocene-containing hybrids with a range of anticancer targets is explained in this chapter.

Keywords: Anti-proliferative Potential, Azide-alkyne Cycloaddition, Biological Activities, Bio-organometallic, Bioferrocene Compounds, Cancer, Cytotoxicity, Ferrocene Compounds, Ferrocifen, Ferrociphenols.

1. INTRODUCTION

Organometallic chemistry and biochemistry have recently been combined to form a new subject known as bioorganometallic chemistry. This new research topic has piqued scientists' interest because of the unusual chemical structure and biological activity of organometallic compounds. These carbon-metal linkage compounds

* Corresponding author Vishu Mehra: Department of Chemistry, Hindu College, Amritsar-143005, India; Tel: +91-183-2547147; Email: vishu3984@gmail.com

Shazia Anjum (Ed.)

All rights reserved-© 2023 Bentham Science Publishers