

Sadaf Jahan
Arif Jamal Siddiqui
Andleeb Khan *Editors*

A Mechanistic Exploration of Natural Compounds for Neuronal Health

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Preface

The proposed book, *Unlocking Neuronal Health: A Mechanistic Exploration of Natural Compounds*, will delve into the fascinating realm of natural compounds and their mechanistic effects on restoring and promoting neuronal health. This book provides a comprehensive overview of the underlying mechanisms through which natural compounds exert their neuroprotective properties, offering a deeper understanding of their therapeutic potential for neurodegenerative disorders. By exploring the intricate interactions between natural compounds and neuronal pathways, this book seeks to bridge the gap between scientific research and practical applications, facilitating the development of novel therapeutic strategies. Chapters included in the book provide detailed information regarding the neurodegenerative disorders, neuronal complications, and reasons behind the culprit. Moreover, many chapters shed light on the mechanistic approach and involvement of natural compounds as therapeutic strategies, thus helpful in the restoration of neuronal health. Ultimately, this book will contribute to the advancement of knowledge in the field and inspire further research and development in this promising area of neuroscience.

Neurodegenerative disorders, such as Alzheimer's disease, Parkinson's disease, and Huntington's disease, pose significant challenges to individuals, families, and healthcare systems worldwide. While conventional treatments offer limited symptomatic relief, the search for more effective and disease-modifying therapies continues. The use of natural compounds derived from plants in the treatment of neurodegenerative disorders is an area of growing interest. These compounds possess diverse chemical structures and biological activities that can target multiple underlying mechanisms involved in neurodegeneration. Through a mechanistic approach, natural compounds offer several potential ways to mitigate the progression of neurodegenerative disorders and promote neuronal health, like anti-inflammatory, anti-oxidative, neurotransmitters, etc.

We would like to express our gratitude to all authors who participated to complete the book. Without their support, this project seems to be incomplete. We also appreciate the role of Springer staff who constantly supported us to complete the project.

There are numerous people who deserve thanks. I, Sadaf Jahan, would like to begin by thanking the Almighty and my late grandma, Mrs. Akhtari Begam, for their unceasing support. My parents, Mr. Furkan Ali and Mrs. Farhat Sultana, my brothers, Mr. Shoeb Ali and Mr. Suhail Ali, and all family members have been a

major source of inspiration for me throughout my life. My husband Muhammad Alam, my son Azlaan Muhammad Umar, and my daughter Huda Jahan Alam are great blessing and support to complete this book successfully.

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I, Andleeb Khan, would like to express my thanks to the Almighty for giving us this vision. My sincere thanks to my parents, Mr. Jameel Uddin Khan and Late Mrs. Anis Un Nisa. My sister, Qudsiya Fatima, has always guided me in all the wax and wane of life. I would like to thank my husband Dr. Syed Wajahat Ali and my kids Syed Muhammad Ali and Muhammad Shayaan Syed for their seamless support while compiling this book.

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Natural Compounds and Their Mechanism of Action: Therapeutic Targets of Neuroprotection and Neurorestoration in Neurodegenerative Diseases

Ehraz M. Siddiqui, Mashoq Ahmad Rather, Sadaf Jahan, Arif Jamal Siddiqui, and Andleeb Khan

Abstract

Endogenous antioxidant defenses are insufficient; therefore, oxidative stress is generated due to excessive production of reactive species, especially reactive oxygen (ROS) and reactive nitrogen (RNS) species, and degradation of cell structures, lipids, proteins, and genetic material. Oxidative stress is a key mechanism underlying the death of neurons, which is an essential component of the pathophysiology of neurodegeneration. One of the medically prescribed antidotes to this skewed oxidation-antioxidation state is the profession of antioxidants. Recently, natural substances with the properties to both scavenge free radicals and protect cells against oxidative threat as well as possess neuroprotective potential have attracted great interest.

This chapter summarized the state-of-research efforts attempting to identify natural chemical derived from medicinal plants that possess protecting action against neurodegenerative processes at molecular levels by controlling the death

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