

Sadaf Jahan
Arif Jamal Siddiqui
Andleeb Khan *Editors*

A Mechanistic Exploration of Natural Compounds for Neuronal Health

A Mechanistic Exploration of Natural Compounds for Neuronal Health

Sadaf Jahan • Arif Jamal Siddiqui
Andleeb Khan
Editors

A Mechanistic Exploration of Natural Compounds for Neuronal Health

 Springer

Editors

Sadaf Jahan
Department of Medical Laboratory
Sciences
College of Applied Medical Sciences
Majmaah University
Al-Majmaah, Saudi Arabia

Arif Jamal Siddiqui
Department of Biology
College of Science, University of Hail
Hail, Saudi Arabia

Andleeb Khan
Department of Biosciences
Faculty of Science, Integral University
Lucknow, Uttar Pradesh, India

ISBN 978-981-95-0124-3 ISBN 978-981-95-0125-0 (eBook)
<https://doi.org/10.1007/978-981-95-0125-0>

© The Editor(s) (if applicable) and The Author(s), under exclusive license to Springer Nature Singapore Pte Ltd. 2025

This work is subject to copyright. All rights are solely and exclusively licensed by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

The publisher, the authors and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, expressed or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

This Springer imprint is published by the registered company Springer Nature Singapore Pte Ltd.
The registered company address is: 152 Beach Road, #21-01/04 Gateway East, Singapore 189721, Singapore

If disposing of this product, please recycle the paper.

Contents

1	Mechanisms of Neuronal Damage and Dysfunction	1
	Uzair Ahmad Ansari	
2	Natural Compounds and Neuroprotection	43
	Vipin K Yadav and Chetan Singh Rajpurohit	
3	Natural Compounds and Their Mechanism of Action: Therapeutic Targets of Neuroprotection and Neurorestoration in Neurodegenerative Diseases	69
	Ehraz M. Siddiqui, Mashoqe Ahmad Rather, Sadaf Jahan, Arif Jamal Siddiqui, and Andleeb Khan	
4	Neurotransmitter Modulation and Cognitive Enhancement	109
	Dipak Kumar, Ranvijay Singh, and Abhishek Kumar Mishra	
5	Natural Compounds and Neuroinflammation	143
	Vishal Mathur, Shaheen Ali, Iqra Zai, and Anam Ilyas	
6	Natural Compounds and Mitochondrial Function	179
	Mohsin Vahid Khan, Mohd. Rumman, Gulam Rabbani, Mohd Kamil Hussain, Sameer Ahmad, and Nafees Ahmad	
7	Natural Compounds and Oxidative Stress Management	207
	Ruchi Yadav, Namira Sana, Uzma Afaq, Chand Bibi, and Jahanarah Khatoon	
8	Natural Compounds as Epigenetic Modulators to Treat Neurodegenerative Disorders	227
	Mohammad Rumman and Mohsin Vahid Khan	
9	Targeting Endoplasmic Reticulum to Treat Neurodegenerative Disorders	249
	Chetan Singh Rajpurohit and Vipin K Yadav	

10	Translational Applications of Natural Compounds in Combatting Neurodegenerative Diseases and Exploring Future Prospects	283
	Arshya Hashim and Faria Fatima	
11	Neurovascular Coupling Dysfunction: Natural Products as a Remedy to Manage Neurodegenerative Disorders	299
	Renu Negi, Shweta Sharma, and Bhaskar Sharma	

[Home](#) > [A Mechanistic Exploration of Natural Compounds for Neuronal Health](#) > Chapter

Translational Applications of Natural Compounds in Combatting Neurodegenerative Diseases and Exploring Future Prospects

| Chapter | First Online: 01 October 2025

| pp 283–298 | [Cite this chapter](#)

A Mechanistic Exploration of Natural Compounds for Neuronal Health

[Arshya Hashim](#)  & [Faria Fatima](#) 68 Accesses

Abstract

Neurodegenerative diseases are a group of disorders characterized by the progressive degeneration and dysfunction of the structure and function of the nervous system. These neurological illnesses remain incurable, and current medicines only alleviate the symptoms. The translational application of natural compounds is gaining momentum against neurodegenerative diseases which involves taking findings from basic research and applying them in clinical settings for therapeutic purposes. Several natural compounds have shown promise in preclinical studies for their potential neuroprotective effects, such as curcumin which is found in turmeric and has antioxidant and anti-

inflammatory properties that may be neuroprotective against diseases like Alzheimer's. Developing curcumin-based supplements or pharmaceuticals for clinical trials could help evaluate their effectiveness in preventing or slowing neurodegenerative processes. Resveratrol, present in red grapes and wine, has been studied for its potential neuroprotective effects and ability to activate sirtuins, proteins associated with longevity. Polyphenols in green tea, such as epigallocatechin gallate (EGCG) and also omega-3 fatty acids, found in fish oil, have anti-inflammatory and neuroprotective properties which can be supplements on cognitive function and disease progression in neurodegenerative disorders. The future prospects of translational applications involving natural compounds against neurodegenerative diseases hold great promise and involve several key areas of development like precision medicine, advanced formulations via nanotechnology, biomarker discovery, targeting multiple pathways, clinical trial design, regulatory pathways, and patient-centric approach. Continued translational research is crucial for advancing our understanding of the therapeutic potential of natural compounds against neurodegenerative diseases. This involves moving beyond preclinical studies to well-designed clinical trials that provide evidence of safety, efficacy, and optimal dosages for these natural interventions. Integrating natural compounds into conventional treatment approaches or developing novel therapeutics based on these compounds holds promise for the future of neurodegenerative disease management.

 This is a preview of subscription content, [log in via an institution](#)  to check access.

Access this chapter

[Log in via an institution](#) →

Subscribe and save

✓ Springer+

from €37.37 /Month

- Starting from 10 chapters or articles per month
- Access and download chapters and articles from more than 300k books and 2,500 journals