Biological, Diagnostic and Therapeutic Advances in Alzheimer's Disease

Ghulam Md Ashraf • Athanasios Alexiou
Editors

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Non-Pharmacological Therapies for Alzheimer's Disease

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Editors
Ghulam Md Ashraf
King Fahd Medical Research Center
King Abdulaziz University
Jeddah, Saudi Arabia

Department of Medical Laboratory Technology, Faculty of Applied Medical Sciences
King Abdulaziz University
Jeddah, Saudi Arabia

Athanasios Alexiou
Novel Global Community Educational Foundation
Hebersham, NSW, Australia

AFNP Med
Wien, Austria

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Preface

Alzheimer's disease (AD) is still a hardly curable disease with several symptoms of behavioral and cognitive impairments. Besides the altered protein levels and the side effects of oxidative stress, it seems that many crucial risk factors play vital roles, even though it is not yet clear what the etiology is and what the result is. The reasons why molecular mechanisms cause neurodegeneration in AD are not known. Alzheimer's disease is a progressive disorder that leads to dementia and affects approximately 10% of the population older than 65 years of age. Memory loss is the first sign of cognitive impairment followed by behavioral disturbances. These symptoms are associated with a rigorous neuronal decline and the appearance of two brain lesions, senile plaques and neurofibrillary tangles, which are mainly composed of Aβ and hyperphosphorylated tau protein, respectively.

While several attempts at reducing AD severity have been presented until now, targeting mainly the symptomatic treatment, it seems that the early diagnosis or even the prediction seems to be the most convincing approach. It is also crucial to mention that in AD, scientists often apply noninvasive therapeutic procedures or medications like cognitive-behavioral therapy and art therapy within enriched sensorimotor environments in order to engage attention, provide pleasure, and improve behavior and communication to the patients. Several published studies reveal the efficacy of applying environmental enrichment in order to increase the effects of enhanced sensory, cognitive, and motor stimulation on different brain areas of the patients, which can lead to improved neuronal activation, signaling, and plasticity between the brain regions.

This book aims to serve as a reference book for those who are interested in the healthy aging, the non-pharmacological methods on AD, and the importance of early diagnosis related to risk factors and biomarkers. The editors deeply acknowledge the excellent work of the authors on presenting the challenges against AD management, in a very unique, interesting, and innovative manner.

Tsagkaris et al. analyze the role of cognitive impairment as a predictive factor of AD, highly associated with the disease progression and the nonpharmaceutical management of the disease.

Bano et al. describe the latest studies on causes, symptoms, and preventing methods of AD, including risk factors and other related comorbidities.

Shah et al. analyze the way that dietary interventions can crucially affect the reduction of neurodegeneration and the various biochemical and genetic alterations and increase the healthy lifespan among the elderly.

Ashfaq et al. discuss carbon nanostructured material-based biosensors as an accurate biomarker for AD detection and identification.

Uddin et al. underlie the role of oxidative stress to AD progression in correlation to mitochondria dysfunction and Aβ- and tau-mediated neurotoxicity.

Alexiou et al. present a set of biologically inspired music algorithms to reveal the importance of art therapy methods on handling AD patients and increase social awareness.

Shah et al. investigate the crucial role of structural and functional neuroimaging on the accurate and efficient AD diagnosis and prognosis.

Ebada et al. demonstrate the role of human gut microbiota in the nervous system and the way that a variety of disturbances of the intestinal microbiota homeostasis may affect the gut-brain axis.

Verma et al. describe the approach of applying stem cell therapy for tissue regeneration in neurodegeneration and AD.

Srivastava et al. underlie the association and the effects of food, exercise, and nutrition over aging and AD progression in terms of age-associated cognitive decline, generation of stress, and neurological fitness.

Zubair presents the most common genetics and neuronal pathways that are associated with the AD leading to neuronal death, synaptic failure, and oxidative stress.

Ali et al. describe the most common biotechnological applications including the BCI and NGS methods, which are involved in the establishment of personalized tool medicine for gene identification and engineering.

Rizvi et al. present the molecular and cellular mechanisms which are correlated to the development and progression of AD and can serve as prospective therapeutic targets.

Hoque et al. reveal the importance of immunotherapy on targeting the senile plaques with limited side effects and toxicity.

Jeddah, Saudi Arabia — Ghulam Md Ashraf
Hebersham, NSW, Australia — Athanasios Alexiou

Keywords

Alzheimer's disease · Biomarkers · Brain imaging · Cognitive and behavioral neuroscience · Diet and nutrition · Early diagnosis · Immunotherapy · Nanostructures · Non-pharmacological therapies · Stem cells

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About the Editors

Dr. Ghulam Md Ashraf currently working as an Associate Professor at King Fahd Medical Research Centre, King Abdulaziz University, Saudi Arabia, completed his PhD in Biochemistry at Aligarh Muslim University, Uttar Pradesh, India. His main research interests are in Proteomics and Neurology. He is also a Research Consultant/Supervisor at Glocal University, India, and an Honorary Faculty Member at the Novel Global Community Educational Foundation (NGCEF), Australia. He has acted as a Principal Investigator or Co-Investigator in various research projects funded by reputed funding agencies, for example, the Deanship of Scientific Research (DSR); King Abdulaziz University, Saudi Arabia; and Strategic Technologies Research Program, King Abdulaziz City for Science and Technology (KACST), Saudi Arabia. He is a Member of the Editorial Board of various journals, for example, *Scientific Reports* (Nature Publishing Group), *Journal of Proteomics* (Elsevier), *Frontiers in Aging Neuroscience*, etc. He is also affiliated with the Protein Society, USA, the Science Advisory Board, and Saudi Society for Genomics and Molecular Oncology, Saudi Arabia. He has published 178 articles in various national and international journals.

Dr. Athanasios Alexiou is a Mathematician with a PhD in Bioinformatics Algorithms and Mathematical Modeling in Biology and a 2-year Postdoctoral Research Fellowship in Neuroinformatics Applications. He currently serves as an Honorary Vice President and Faculty Member at the Novel Global Community Education Foundation (NGCEF), Australia, and as Head of the Scientific Advisory Board of the AFNP Med Company in Austria. His main research field is Biomedical Informatics, with a special interest in Medical Decision Support Systems, Algorithms in Neuroinformatics and Computational Biomedicine, Neurodegenerative Diseases, and Biomarker Modeling. He is an Associate Editor of the journals *Genetics*, *Pharmacology*, and *Sociology*, a Guest Associate Editor of the *Frontiers in Neuroscience* journal for the research topic "The Alzheimer's Disease Challenge," and the author/coauthor of several peer-reviewed scientific papers in various journals and books.