

# Basic information about memantine and its treatment of Alzheimer's disease and other clinical applications

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## Abstract

Memantine is a noncompetitive moderate-affinity strong voltage-dependent N-methyl-D-aspartate receptor antagonist. It has been used to treat Alzheimer's disease (AD) since 1989. In 2018, it became the second most commonly used drug for the treatment of dementia in the world. AD is nonreversible, and memantine can only relieve the symptoms of AD but not cure it. Over the past half-century, memantine's research and clinical application have been extensively developed. In this review, the basic composition of memantine, the mechanism and limitations of memantine in the treatment of AD, memantine combination therapy, comparison of memantine with other drugs for AD, and clinical studies of memantine in other diseases are reviewed to provide a valuable reference for further research and application of memantine for the treatment of AD.

## KEYWORDS

Alzheimer's disease, memantine, N-methyl-D-aspartate receptor

## 1 | INTRODUCTION

Memantine was patented in 1966. Memantine is an antagonist of the glutamate receptor N-methyl-D-aspartic (NMDA) acid receptor subtype. The neurotoxicity associated with AD and other neurodegenerative diseases can be moderated by memantine. Also, moderate to severe AD is usually treated with memantine.<sup>1,2</sup> Memantine alleviates the progression of AD mainly by enhancing cholinergic signaling with the inhibition of glutamate hyperactivation. However, due to the complex pathogenic mechanism of AD, it is not well studied. All drugs used to treat AD, including memantine, cannot cure AD, but can only slow down the disease process.<sup>3</sup> Recently, the functions of

memantine have been intensively studied. Further pharmacological effects of memantine have been revealed and applied for clinical applications, such as neuroprotection in ischemic brain injury after cardiac arrest, treatment of vascular dementia, treatment of ischemic stroke, treatment of Parkinson's disease dementia, alleviation of acute lung injury (ALI), and so on. Memantine has a wide range of effects and is of great significance for AD. Memantine is a safe and relatively economical choice for both long- and short-term applications in the treatment of AD. In this review, we focus on the history, therapeutic mechanism, and limitations of memantine in the treatment of AD. We also introduce clinical research and the potential use of memantine in other diseases.

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# Alzheimers Disease From Basic Research To Clinical Applications

**Hermann J. Gertz, Thomas Arendt**



## **Alzheimer's Disease From Basic Research To Clinical Applications:**

*Alzheimer's Disease - From Basic Research to Clinical Applications* Hermann J. Gertz, Thomas Arendt, 2013-06-29 As human longevity continues to be extended so will the impact of age associated dementia on individual lives and society Alzheimer's disease as the most common cause of dementia in the elderly remains a sentinel problem and its underlying pathology is still poorly understood Available therapeutic strategies require considerable refinement and the development of new therapeutic strategies need input from basic research Thus continued efforts are necessary both to understand basic mechanisms of the condition and to achieve more powerful therapies This volume brings together the reports of basic scientists and clinical investigators The chapters provide a spectrum of information valuable for clinicians and scientists This issue bridges the gap between laboratory work in basic science and the development of urgently needed therapeutic strategies Areas presented are the molecular and cellular biology of the disease pathogenetic mechanisms and potential therapeutic targets genetics risk factors strategies of prevention and treatment as well as practical aspects of medical and social care for patients with Alzheimer's disease

**Solving the plasmalogen puzzle - from basic science to clinical application** Masanori Honsho, Fabian Dorninger, Johannes Berger, 2023-02-17 *Alzheimer's Disease Research* United States. Congress. Senate. Committee on Appropriations. Subcommittee on Departments of Labor, Health and Human Services, Education, and Related Agencies, 2004

**Advances in Integrative Medicine for Neurodegenerative Diseases: From Basic Research to Clinical Practice** Shouan Liu, Guo-qing Zheng, Hansen Chen, Guowei Li, Xinfeng Guo, 2024-03-08 Neurodegenerative diseases NDs are disorders characterized by progressive loss of neurons and may finally lead to severe impairments even death NDs are age dependent disorders growing evidence suggests that nearly all aged brains exhibit characteristic changes that are associated with neurodegeneration As the global rapidly aging population the prevalence of NDs is which have become the most dreaded disease of aged people Studies report that the expenses of these older patients with NDs exceed the total medical expenses of patients with cancer and cardiovascular diseases

**Advances in Research on Neurodegeneration** Werner Poewe, Gerhard Ransmayr, 2012-12-06 The book contains original articles and reviews presented at the 6th International Winter Conference on Neurodegeneration held from November 20-23 1997 in Kitzbühel Austria The aim of this conference was to present and discuss recent data on the interface between neuroimmunology and neurodegeneration in particular susceptibility to autoimmune and neurodegenerative processes neuroprotection and restorative treatment strategies These issues were discussed in the light of recent developments in multiple sclerosis Parkinson's disease amyotrophic lateral sclerosis Huntington's disease and multisystem atrophy The articles highlight topics which are particularly interesting for the clinician and the neuroscientist Some of the neuroprotective strategies have already been developed or are at present clinically investigated The neuroprotective role of deep brain stimulation anticholinergic therapy and apomorphine will be verified in clinical studies in the near future This

is also the case for future therapeutic approaches to restoration of the damaged nervous system such as somatic gene therapy implantation of genetically modified cell lines and medically controlled and directed development of embryonic cells. The conference highlighted the role of the glia which seems to play a key role both in traditionally as neuroimmunological and neurodegenerative disorders classified diseases as indicated above. The topics discussed in the book are significant for recent developments in clinical neurology and neuroscience as shown in the current literature and at international congresses.

**Alzheimer's Disease Research** Christian Behl, 2023-07-13 This book highlights the key phases and central findings of Alzheimer's Disease research since the introduction of the label Alzheimer's Disease in 1910. The author Christian Behl puts dementia research in the context of the respective zeitgeist and summarizes the paths that have led to the currently available Alzheimer's drugs. As the reader is taken through the major developments in Alzheimer's Disease research particularly over the past thirty years, Behl poses critical questions: Why are the exact causes of Alzheimer's Disease still in the dark despite all the immense worldwide research efforts in academia as well as in the pharmaceutical industry? Why has the majority of an entire research field kept focusing on a single hypothesis that establishes the deposition of the amyloid beta peptide in the brain as the key trigger of Alzheimer's pathology even though this concept has still not been convincingly proven in the clinics? Are there other hypotheses that might explain the pathogenesis of this complex brain disease and if so why were these perspectives not adequately followed? In this book Behl tries to answer these questions. Starting with the historical background, the author illustrates the long and arduous research journey, its numerous setbacks and the many alternative explanations for the disease which have started gaining increasing attention and acceptance in the Alzheimer's research community only more recently. With his deep dive into the history and progression of this research including the most recent developments, Behl explains why he believes that it is high time to promote a paradigm shift in Alzheimer's Disease research. The book is written for all researchers in the fields of neurobiology and neurodegeneration as well as other biomedical fields who would like to gain a broad and beyond the surface insight into the key developments of one of the most promoted research fields of our time. With its extensive literature references and over 100 illustrations, the book is also attractive for students and interested lay persons. Elaborating on all the different aspects and research approaches of this research field, the author aims to convince the reader that the underlying causes of Alzheimer's Disease may be much more complex than previously thought and that this must be considered for future research directions. While he hopes that the Alzheimer's research community is finally ready to shed its amyloid straitjacket that has hampered progress for too long, he is also convinced that a much needed paradigm shift can guide future Alzheimer's Disease research and provide a new and broader perspective on this age dependent brain disease.

**Lymphocyte Trafficking in Health and Disease** Raffaele Badolato, Silvano Sozzani, 2006-09-05 This book deals with the description of the role of chemokines in immune response and underlines potential targets of therapeutical intervention. It offers a series of international contributions of the most

challenging aspects of lymphocyte migration in homeostasis and in disease and has a special focus on diseases and targets of therapeutical intervention The book will interest researchers and clinicians from inflammation research **Alzheimer's Disease and Related Disorders** United States. Congress. Senate. Committee on Labor and Human Resources. Subcommittee on Aging,1985 *The Hereditary Basis of Rheumatic Diseases* Rikard Holmdahl,2006-07-02 Rheumatoid Arthritis RA represents a complex disease where the inheritable component has been estimated to be up to 60% This PIR volume deals with the genetic basis and regulation of rheumatic diseases The first part of the book describes genetic studies on rheumatic diseases The second part deals with the shared heredity of rheumatic diseases e g RA lupus and ankylosing spondylitis The third part of the volume describes tools for analysing genetic complexity ranging from animal models to new molecular tools The volume is essential reading for researchers and clinicians from rheumatology inflammation research immunology and cell and molecular biology **New Trends in the Diagnosis and Therapy of Alzheimer's Disease** Kurt A. Jellinger,Gernot Ladurner,Manfred Windisch,2012-12-06 Alzheimer s Disease AD the most frequent cause of mental decline in the elderly represents one of the major health problems facing modern society Despite considerable progress in the clinical diagnosis epidemiology structural basis biochemistry molecular genetics and pharmacological aspects of AD its etiology molecular backgrounds and treatment challenges are still poorly understood This volume based on the 2nd International Symposium of EBEWE Research Initiative in October 1993 in Salzburg Austria is conceived as a review of our current knowledge of morphology diagnostic clinical and imaging techniques methodological approaches of cognitive assessment trial designs outcome variables and possibilities of therapy of AD and other neurodegenerative disorders The book s coverage is broad and it should be of interest for investigators clinicians and researchers involved in the problems of AD **Frontiers in Pluripotent Stem Cells Research and Therapeutic Potentials Bench-to-Bedside** Kuldip S. Sidhu,2012 Pluripotent stem cells have garnered tremendous interest in recent years which is primarily driven by the hope of finding a cure for several debilitating human diseases Cell transplantation regenerative medicine offers considerable therapeutic potential **Toll-like Receptors in Inflammation** Luke A.J. O'Neill,Elizabeth Brint,2006-03-16 A repertoire of 10 TLRs mediate the first response to all microbes that infect mammals They are the long sought receptors for a wide range of microbial products Notable examples include TLR4 which recognizes LPS from gram negative bacteria TLR3 which recognizes viral double stranded RNA and TLR9 which recognizes CpG DNA motifs found commonly in both viruses and bacteria TLRs are increasingly being implicated in both infectious and inflammatory diseases notable examples being sepsis inflammatory bowel disease atherosclerosis and asthma There is therefore great interest in targeting TLRs therapeutically since blocking TLRs will result in a decrease in the production of inflammatory mediators such as TNF This volume covers our current understanding of TLRs and their role in inflammation Given the primacy of TLRs in the inflammatory process and their emerging role in inflammatory diseases the book is of great interest to researchers working in inflammation and immunology **Women in**

**Alzheimer's Disease and Related Dementias: 2022** Allison B. Reiss, Susana Castro-Obregon, Gloria Patricia Cardona Gomez, 2023-12-19      Research Progress in Alzheimer's Disease and Dementia Miao-Kun Sun, 2007 Alzheimer's disease AD is the most common type of neurodegenerative disorder in the ageing population with dementia as a common consequence AD is defined pathologically by the appearance of extracellular senile plaques and intracellular neurofibrillary tangles as described by Alois Alzheimer about a century ago The causes for AD include genetic predisposition in a small population ageing and environmental stresses in majority cases The underlying pathogenic cascades increases in expression of amyloid precursor protein and accumulation of A and reactive oxidant activity and inflammation have the features of both adaptive at least initially and harmful when becoming excessive Dementia on the other hand is a clinical diagnosis and is defined as globally persistently impaired cognitive skills including memory Alzheimer dementia refers to clinical dementia in patients who also have Alzheimer neuropathology Alzheimer dementia is what brings the patients to seek medical treatments An extraordinary inability to form new memory especially of those episodic type and executive dysfunction are among the earliest symptoms in AD patients In end stage AD cognitive degeneration extends far beyond memory loss The underlying causes include decreases in impaired brain metabolism which results in impaired synaptic functions and capacities thus impaired information processing and eventually leads to neuronal injury and death This book presents leading edge research in this dynamic field      Medical Advancements in Aging and Regenerative Technologies: Clinical Tools and Applications Daskalaki, Andriani, 2012-11-30 This book translates basic science discoveries into regenerative therapies with the application of clinical tool in aging and tissue regeneration      *Proceedings of 11th International Conference on Alzheimers Disease & Dementia 2018* Conference Series, May 24-25 2018 Vienna Austria Key Topics Dementia an underlying disease Symptoms and Diagnosis of Dementia Vascular Dementia Alzheimer's Diagnosis and Symptoms Alzheimer's Imaging and Clinical trials Alzheimer's Pathophysiology Parkinson's disease Dementia with Lewy bodies Frontotemporal dementia Wernicke Korsakoff Syndrome Amyloid Protein in Dementia Neurocognitive Disorder Dementia Care Practice Awareness Therapeutic Targets Mechanisms for Treatment Animal Models Translational Medicine Mixed Dementia Alzheimer's Disease and Dementia Natural Remedies      New Developments in Medical Research United States. Congress. House. Committee on Commerce. Subcommittee on Health and the Environment, 1998      Progress Report on Alzheimer's Disease, 2000

**Antioxidants and Functional Foods for Neurodegenerative Disorders** Abhai Kumar, Debasis Bagchi, 2021-01-07 Neurodegenerative diseases including Alzheimer's and Parkinson's disease are a growing problem across the world's aging population Oxidative stress in the brain plays a central role in a common pathophysiology of these diseases This book presents scientific research on the potential of antioxidant therapy in the prevention and treatment of neurodegenerative disorders This book outlines the roles of oxidative stress and diabetes mellitus in neurodegeneration describes the molecular mechanisms of neurodegenerative disorders including the roles of environmental pollutants and inflammatory responses and

explores mitochondrial dysfunction It then describes the protective abilities of antioxidants including vitamin D tocotrienol and coenzyme Q10 against neurodegeneration The book demonstrates the therapeutic potential of ketogenic diets and highlights the roles of medicinal plants phytopharmaceuticals traditional medicines and food nutrients in neuroprotection

**Key Features** Explains damage caused by numerous neurodegenerative disorders and the possible protection offered by antioxidants and functional foods Describes molecular mechanisms of neurodegeneration by oxidative stress advancing age diabetes and mitochondrial dysfunctions Demonstrates protection offered by nutraceuticals antioxidants botanical extracts and functional foods The book contains twenty three chapters divided into six sections written by leading researchers This book is essential reading for health professionals dietitians food and nutrition scientists and anyone wanting to improve their knowledge of etiology of neurodegenerative diseases

*2015: Which new directions for Alzheimer's disease?* Ludovic Martin, 2015-06-03 According to the World Health Organization more than 40 million people in the world are affected with dementia To date 60 70% of the cases of dementia are attributed to the Alzheimer s disease AD This neurodegenerative disorder gradually takes place over a period of at least 20 years before the onset of symptoms which are impaired memory apathy and depression The characteristics of AD consist in neurofibrillary tangles intraneuronal aggregates of hyperphosphorylated tau proteins and senile plaques dense extraneuronal deposits composed of amyloid A The other features linked to these two core pathological hallmarks of AD are inflammation oxidative stress progressive synaptic and neuronal loss In past years some of the emerging therapeutic strategies against AD were employed to deal with the pathological hallmarks of the disease Science teams all over the world try to restore the tau phosphorylation equilibrium Their purpose is to interfere with the aggregation of tau and decrease its amount of proteins per se as well Furthermore they are trying either to stimulate the elimination processes of the aggregated tau proteins or to stop the formation of A peptides This could be reached by the stimulation of the classic techniques of protein degradation such as the autophagic pathway or by the targeted immunotherapy In this Research Topic we wish to summarize and review the etiology of AD and the related therapeutic opportunities for the next decades To fully understand the precise mechanisms underlying AD research findings reviews new insights and new approaches include AD and related tauopathies tau phosphorylation balance pharmacological compounds against AD neuroprotection strategies and new therapeutic ways but also risk factors for AD and AD genetic information are included in this issue

## Unveiling the Energy of Verbal Beauty: An Psychological Sojourn through **Alzheimers Disease From Basic Research To Clinical Applications**

In a world inundated with screens and the cacophony of instantaneous interaction, the profound power and emotional resonance of verbal beauty frequently diminish in to obscurity, eclipsed by the constant barrage of noise and distractions. However, set within the lyrical pages of **Alzheimers Disease From Basic Research To Clinical Applications**, a captivating perform of literary beauty that impulses with fresh thoughts, lies an memorable trip waiting to be embarked upon. Penned by way of a virtuoso wordsmith, this enchanting opus manuals readers on a psychological odyssey, delicately exposing the latent potential and profound affect embedded within the complicated internet of language. Within the heart-wrenching expanse with this evocative examination, we can embark upon an introspective exploration of the book is key styles, dissect their captivating publishing type, and immerse ourselves in the indelible impact it leaves upon the depths of readers souls.

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