

Alzheimer's

Regenerative Stem Cell Therapy for Neurodegenerative Diseases: An Overview

Neurodegenerative diseases resulting from the progressive loss of structure and/or function of neurons contribute to different paralysis degrees and loss of cognition and sensation. The lack of successful curative therapies for neurodegenerative



disorders lead to a considerable burden on society and a high economic impact. Over the past 20 years, regenerative cell therapy, also known as stem cell therapy, has provided an excellent opportunity to investigate potentially powerful innovative strategies for treating neurodegenerative diseases. This is due to stem cells' capability to repair injured neuronal tissue by replacing the damaged or lost cells with differentiated cells

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➤ Immunomodulatory role of mesenchymal stem cells in Alzheimer's disease

<u>Alzheimer's disease</u> (AD) is one of the most common causes of dementia and is characterized by gradual loss in memory, language, and cognitive function.



The hallmarks of AD include extracellular amyloid deposition, intracellular neuronal fiber entanglement, and neuronal loss. Despite strenuous efforts toward the improvement of AD,

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Stem cell therapies for Alzheimer's disease is it time?

To determine the safety and efficacy of mesenchymal stem cell (MSC)-neurotrophic factor (NTF) cells (NurOwn®, autologous bone marrow-derived MSCs, induced to secrete NTFs) delivered by combined intrathecal and intramuscular administration to participants with amyotrophic lateral sclerosis (ALS) in a phase 2 randomized controlled trial.

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> Stem cell therapy in Alzheimer's disease: possible benefits and limiting drawbacks

Alzheimer's disease (AD) is the sixth leading cause of death globally and the main reason for dementia in elderly people. AD is a long-term and progressive neurodegenerative disorder that steadily worsens memory and communicating skills eventually leads to a disabled person of performing simple daily tasks.



Unfortunately, numerous clinical trials exploring new therapeutic drugs have encountered disappointing outcomes in terms of improved cognitive performance since they are not capable of halting or stimulating the regeneration of already-damaged neural cells, and merely provide symptomatic relief. Therefore, a deeper understanding of the mechanism of action of stem cell may contribute to the development of novel and effective therapies.

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> Alzheimer's disease and stem cell therapy

The loss of neuronal cells in the central nervous system may occur in many neurodegenerative diseases. Alzheimer's disease is a common senile disease in people over 65 years, and it causes impairment characterized by the decline of mental function, including memory loss and cognitive impairment, and affects the quality of life of patients. However, the current therapeutic strategies against AD are only to relieve symptoms, but not to cure it. Because there are only a few therapeutic strategies against Alzheimer's disease, we need to understand the pathogenesis of this disease. Cell therapy may be a powerful tool for the treatment of Alzheimer's disease. This review will discuss the characteristics of Alzheimer's disease and various available therapeutic strategies.

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> Stem cell therapy for Alzheimer's disease

Alzheimer's disease (AD) is a progressive neurodegenerative disease characterized by memory loss and cognitive impairment. It is caused by synaptic failure and excessive accumulation of misfolded proteins. To date, almost all advanced clinical trials on specific AD-related pathways have failed mostly due to a large number of neurons lost in the brain of patients with AD. Also, currently available drug candidates intervene too late. Stem cells have improved characteristics of self-renewal, proliferation, differentiation, and recombination with the advent of stem cell technology and the transformation of these cells into different types of central nervous system neurons and glial cells. Stem cell treatment has been successful in AD animal models. Recent preclinical studies on stem cell therapy for AD have proved to be promising.



Stem cell treatment for Alzheimer's disease

Alzheimer's disease (AD) is a progressive and neurodegenerative disorder that induces dementia in older people. It was first reported in 1907 by Alois Alzheimer, who characterized the disease as causing memory loss and cognitive impairment. Pathologic characteristics of AD are β -amyloid plaques, neurofibrillary tangles and neurodegeneration. Current therapies only target the relief of symptoms using various drugs, and do not cure the disease.



Recently, stem cell therapy has been shown to be a potential approach to various diseases, including neurodegenerative disorders, and in this review, we focus on stem cell therapies for AD.



Mesenchymal Stromal Cell Therapies for Neurodegenerative Diseases

Mesenchymal stromal cells are multipotent cells that are being used to treat a variety of medical conditions. Over the past decade, there has been considerable excitement about using MSCs to treat neurodegenerative diseases, which are diseases that are typically fatal and without other robust therapies. In this review, we discuss the proposed MSC mechanisms of action in neurodegenerative diseases, which include growth factor secretion, exosome secretion, and attenuation of neuroinflammation. We then provide a summary of preclinical and early clinical work on MSC therapies in amyotrophic lateral sclerosis, multiple system atrophy, Parkinson's disease, and Alzheimer's disease. Continued rigorous and controlled studies of MSC therapies will be critical in order to establish efficacy and protect patients from possible untoward side effects.

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