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Alzheimer's Disease: A Comprehensive Review of Pathophysiology, Diagnosis and Therapeutic Strategies

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Abstract

Alzheimer's disease is a neurodegenerative disorder that causes progressive memory loss and cognitive decline. Alzheimer's disease (AD) is a disorder that causes degeneration of the cells in brain. It is the most common form of dementia, accounting for 60-70% of cases. The disease gradually impairs thinking, reasoning, and the ability to perform simple tasks, and also affects behavior and personality. Alzheimer's is not a normal part of aging and is characterized by the buildup of abnormal proteins in the brain, leading to the death of nerve cells. The genetic risk factor found to be associated with this disease is mutation in APP, PSEN1 and PSEN2 genes There are some symptomatic treatments to manage the psychological symptoms but none of these drugs can halt disease progression. This review focused on Alzheimer's disease pathophysiology to provide a better understanding of disease pathogenesis hypotheses and decipher the role of genetic and epigenetic factors in disease development and progression. Current pharmaceutical treatment available for AD.

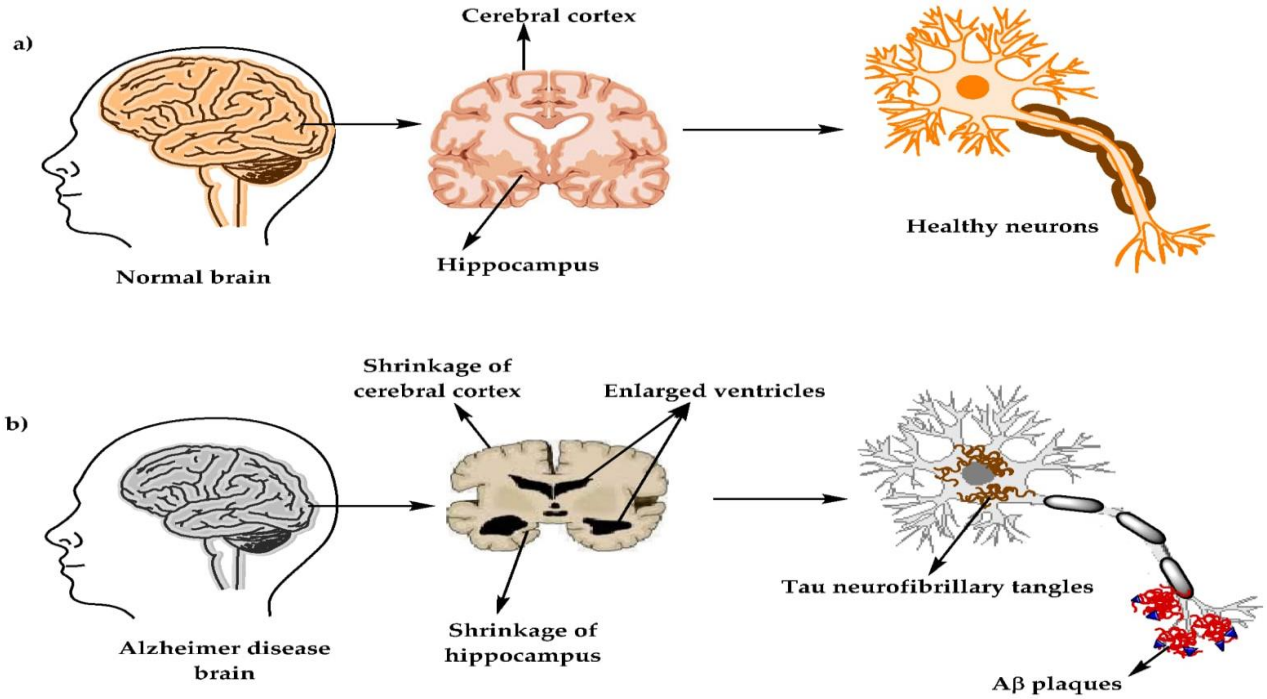
Keyword: Alzheimer's disease, Alzheimer's disease symptoms, Alzheimer's disease treatment

INTRODUCTION

AD is a progressive neurodegenerative condition, particularly in those 65 years or older, and is a leading cause of dementia. It gradually erodes cognitive abilities and interpersonal engagement due to brain cell degeneration. Alzheimer's disease (AD) is a polygenic and multifactorial disease characterized by the deposition of amyloid-β (Aβ) fibrils in the brain, leading to the formation of plaques and neurofibrillary tangles (NFTs), and ultimately resulting in dendritic dysfunction, neuronal cell death, memory loss, behavioural changes.Worldwide population is rapidly aging, and the cases of dementia are growing. (1)It has been reported that 35 million people worldwide have Alzheimer Disease (AD) or other types of dementia and about 65 million people are expected to have dementia problem by 2030 (3)Progressive loss of cognitive functions can be caused by cerebral disorder like Alzheimer's disease (AD) or other factors such as intoxications, infections, abnormality in the pulmonary and circulatory systems, which causes a reduction in the oxygen supply to the brain, nutritional deficiency, vitamin B12 deficiency, tumors, and others Such conditions include hypercholesterolemia, hypertension, diabetes, obesity, depression, and cardiovascular diseases. Additionally, complications arising from AD progressions, like thrombosis, mobility impairments, dysphagia, malnutrition, and pneumonia (lung infections), may

considerably diminish the life quality of patients and increase mortality risk. (2)

SYMPTOMS



1. Memory Loss.

Memory loss is the key symptom of Alzheimer's disease. Early in the disease, people may have trouble remembering recent events or conversations. Everyone has trouble with memory at times, but the memory loss related to Alzheimer's disease is lasting. People with Alzheimer's may forget important dates, events, and conversations, and they may rely on reminders and notes to remember things. This makes social interactions more difficult and can lead to isolation (3)

2. Reasoning.

Doing more than one task at once is especially hard. It may be challenging to manage finances, balance check books and pay bills on time. Eventually people with Alzheimer's disease may not recognize numbers. This can affect your ability to Decide what to do next, follow a recipe, Make plans.

3. Language

It can feel like the word is on the 'tip of their tongue' but then it doesn't come to them. This can also happen with names of people or places. People with the disease may have trouble finding he right words, following conversations, and understanding written or spoken language.

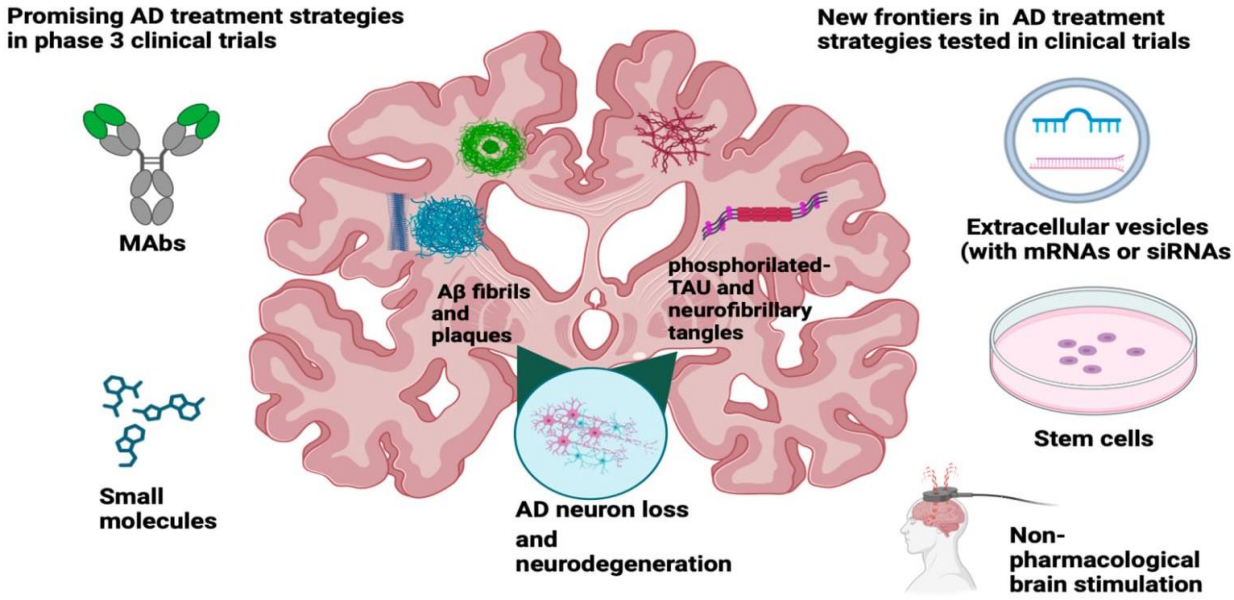
4. Behavior and personality

Brain changes that occur in Alzheimer's disease can affect moods and behaviours. Symptoms may include: Depression, Loss of interest in activities. Social withdrawal. Mood swings. Not trusting others. Anger or aggression. Changes in sleeping habits. Wandering. Loss of inhibitions. Everyone has a bad day or feels upset sometimes. But mood and personality changes caused by Alzheimer's are more intense or sudden than everyday anger or grumpiness (4)

5. Spatial understanding

Spatial understanding difficulties are a key symptom of Alzheimer's disease, manifesting as problems

with visual-spatial relationships, navigation, and coordination. Individuals with Alzheimer's may struggle to judge distances, understand maps, or navigate familiar environments, sometimes getting lost easily, Bumping into furniture, Having a tough time picking something up.(5)



TREATMENT

Your provider will suggest treatments to slow down how fast you develop dementia. Starting treatment as soon as possible is the best way to maintain your brain health throughout your life. But there currently isn't a treatment available that stops or reverses Alzheimer's disease. Pharmacological treatments include cholinesterase inhibitors and memantine. Cholinesterase inhibitors, such as donepezil, rivastigmine, and galantamine, work by increasing the levels of a neurotransmitter called acetylcholine in the brain.

1. CHOLINESTERASE INHIBITORS.

These medicines work by boosting levels of cell-to-cell communication. The medicines preserve a chemical messenger that is depleted in the brain by Alzheimer's disease. (17) Boosting acetylcholine levels can restore memory and other cognitive skills like judgment, language, and problem solving, to the way they were six months or even a year before, if you have mild Alzheimer's. The effects can last for a couple of years in some people, but some people may just see moderate results temporarily. (6)

2. MEMENTINE

This medicine works in another brain cell communication network and slows the progression of symptoms with moderate to severe Alzheimer's disease.The medicines prevent amyloid plaques in the brain from clumping. Memantine is a common NMDA antagonist. Your provider may suggest others depending on your health and which stage of Alzheimer's disease you have.While these medications represent our best current available pharmacological treatments in AD, they have relatively small average overall effect and do not alter the course of the underlying neurodegenerative process. Alzheimer's patients produce more glutamate than normal—and while that may seem like a good thing, it isn't. Too much glutamate in the brain overstimulates neurons and damages them, causing them to die off. (7)

3. DONEPEZIL.

The brand name of this medication is Aricept®.This medication works by improving your attention,

memory and ability to engage in your daily activities. It isn't a cure for Alzheimer's disease or dementia. (10) The latest guidelines recommend that these medicines should be continued in the later, severe, stages of the disease.The side effects usually get better after 2 weeks of taking the medicine.(11) If you're already taking Aricept or another cholinesterase inhibitor, but need the extra boost to function better, this drug combines the two to temporarily slow down symptoms and improve thinking. The side effects include dizziness, headaches, nausea, and vomiting.(8)

4. REVASTIGMINE.

The brand name of this medication is Exelon® Rivastigmine is a medication that treats mild to moderate. Dementia affects your thinking, memory, reasoning, personality, mood and behaviour.(9) Rivastigmine is used to treat mild to moderate dementia (memory loss and mental changes) associated with Alzheimer's disease or Parkinson's disease. Compliance improved from baseline to 18 months and for 88.2% of patients caregivers preferred the transdermal patch to oral medications. (10)

CONCLUSION

Herein, we provide a comprehensive review on Alzheimer's disease highlighting the mainstream hypotheses explaining disease pathophysiology as well as current disease treatments and drug discovery projects. Ultimately, these studies will increase our chances of identifying validated diagnostic biomarkers and effective disease-modifying cures.Various studies have shown that the causative metabolic pathways include's extracellular amyloid plaques, intracellular neurofibrillary tangles, synaptic deterioration, and neuronal death which ultimately leads to AD as a neurodegenerative disorder.Future therapies that target pathology and the use of combination therapy may have a potential to slow the progression of AD pathology. (11) Various aspects of addressing AD have been consolidated, such as multiple hypotheses, single targets, and MTDLs. Aβ aggregation inhibitors, metal chelators, and neuroprotective mechanisms appear to hold promise, and MTDLs are expected to play a crucial role in the management of AD. In conclusion, although a cure for Alzheimer's disease through drug therapy has not yet been found, significant progress is being made. The progression through mild, moderate, and severe phases encompasses a range of cognitive, behavioural, and physical changes. As highlighted in this detailed overview, the early stage marks subtle memory failure and confusion. It progresses to moderate challenges in communication and daily tasks. Our focus in managing patients with dementia must remain well rounded and holistic, concentrating not just on pharmacological therapy but also on the complex biopsychosocial aspects of caring for this group of patients By carefully observing what comes directly before and after a behaviour, the caregiver may be able to determine the underlying need and learn how to alleviate the challenging behavior.Providing a safe, clean, home-like environment in which residents and staff work together has been shown to improve outcomes in those with dementia.In conclusion, Alzheimer's disease presents a significant challenge due to its progressive nature, lack of cure, and impact on individuals and their families. While research continues to advance, a multifaceted approach to care, support, and ongoing research is crucial to improve the lives of those affected by this devastating disease.

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