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**A Review study of Role Of Membrane Biophysics In  
Alzheimer disease,Sudan,2024.**

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**Abstract:**

Cellular membrane alterations are commonly observed in many diseases, including Alzheimer's disease (AD). Membrane biophysical properties, such as membrane molecular order, membrane fluidity, organization of lipid rafts, and adhesion between membrane and cytoskeleton, play an important role in various cellular activities and functions. While membrane biophysics impacts a broad range of cellular pathways, this review addresses the role of membrane biophysics in amyloid- $\beta$  peptide

**Key wards:Cellular Membrane ,Alzahimar,Oxidative Pathway**

protein processing, and cerebral endothelial functions in AD. Understanding the mechanism(s) underlying the effects of cell membrane properties on cellular processes should shed light on the development of new preventive and therapeutic strategies for this devastating disease.

## **Introduction:**

Alzheimer's disease is a neurodegenerative disorder that is the most common cause of cognitive decline in the elderly. It is characterized by memory loss, impaired reasoning, and difficulty performing daily tasks effectively. Over time, the symptoms worsen, leading to a loss of ability to communicate and interact with the surrounding environment. The name Alzheimer's originates from the Austrian physician Alois Alzheimer, who first described the condition in 1906. Since then, Alzheimer's has become one of the most widespread and impactful diseases in global societies, due to the ongoing increase in average life expectancy and the growing number of people affected by this disease. Alzheimer's disease describes structural and functional changes that result in the destruction of brain cells, leading to the formation of accumulations of beta-amyloid protein inside the brain. These accumulations are believed to cause nerve damage and functional aspects of cellular membranes and the impact of changes within them on the formation and spread of proteins.

## **Objective:**

Our study proposes to find out the effect of biological membranes on the progression of Alzheimer's disease and methods of treatment, also to find out the effects of Alzheimer's disease on the human body.

## **Method and Material:**

Was non-interventional, Descriptive, Probable, Simple random, Report study. Done by reviewing online articles from different web sites.

## **Result:**

### **The role of current research and Study of cell death in disease-Current understanding of the NCCD 2023.**

Apoptosis is a form of regulated cell death (RCD) that involves

proteases of the caspase family. Pharmacological and genetic strategies that experimentally inhibit or delay apoptosis in mammalian systems have elucidated the key contribution of this process not only to (post-)embryonic development and adult tissue homeostasis, but also to the etiology of multiple human disorders. Consistent with this notion, while defects in the molecular machinery for apoptotic cell death impair organismal development and promote oncogenesis, the unwarranted activation of apoptosis promotes cell loss and tissue damage in the context of various neurological, cardiovascular, renal, hepatic, infectious, neoplastic and inflammatory conditions. Here, the Nomenclature Committee on Cell Death (NCCD) gathered to critically summarize an abundant pre-clinical literature mechanistically linking the core apoptotic apparatus to organismal homeostasis in the context of disease

### **Dietary Fiber and Microbiota Metabolite Receptors**

### **Enhance Cognition and Alleviate Disease in the 5xFAD**

### **Mouse Model of Alzheimer's Disease**

Alzheimer's disease (AD) is a neurodegenerative disorder with poorly understood etiology. AD has several similarities with other "Western lifestyle" inflammatory diseases, where the gut microbiome and immune pathways have been associated.

Previously, we and others have noted the involvement of metabolite-sensing GPCRs and their ligands, short-chain fatty acids (SCFAs), in protection of numerous Western diseases in mouse models, such as Type I diabetes and hypertension.

Depletion of GPR43, GPR41, or GPR109A accelerates disease, whereas high SCFA yielding diets protect in mouse models. Here, we extended the concept that metabolite-sensing receptors and SCFAs may be a more common protective mechanism against Western diseases by studying their role in AD pathogenesis in the 5xFAD mouse model. Both male and female mice were included. Depletion of GPR41 and GPR43 accelerated cognitive decline and impaired adult hippocampal neurogenesis in 5xFAD and WT mice. Lack of fiber/SCFAs accelerated a memory deficit, whereas diets supplemented with high acetate and butyrate (HAMSAB) delayed cognitive decline in 5xFAD mice. Fiber intake impacted on microglial morphology in WT mice and microglial clustering phenotype in 5xFAD mice. Lack of fiber impaired adult hippocampal neurogenesis in both W and AD mice. Finally, Techniques and methods used in studying the biophysics of maternal dietary fiber intake significantly biological membrane affects offspring's cognitive functions in 5xFAD mice and microglial transcriptome in both WT and 5xFAD mice, suggesting that SCFAs may exert their effect during pregnancy and lactation. Together, metabolite-sensing GPCRs and SCFAs are essential for protection against AD, and reveal a new strategy for disease prevention.

Significance Statement Alzheimer's disease (AD) is one of the most common neurodegenerative diseases; currently, there is no cure for AD. In our study, short-chain fatty acids and metabolite receptors play an important role in cognitive function and pathology in AD mouse model as well as in WT mice. SCFAs also impact on microglia transcriptome, and immune cell

recruitment. Our study indicates the potential of specialized diets (supplemented with high acetate and butyrate) releasing high amounts of SCFAs to protect against disease.

### **Techniques and methods used in studying the biophysics of biological membranes**

Studying the biophysical physics of biological membranes uses a variety of techniques and methods to understand the interactions and processes that occur within these membranes. Some of the techniques and methods used in this field include:

1. **Biophysical Spectroscopy:** This technique is used to study chemical reactions and changes that occur within biological membranes by analyzing changes in the frequencies and electromagnetic waves emitted from the membranes.
2. **Biological Imaging Techniques:** These techniques, such as electron microscopy and light microscopy, are used to monitor and observe biological membranes at the cellular and molecular levels.
3. **Surface Sensing Techniques:** These techniques, such as mass spectrometry, are used to measure changes that occur on the surface of biological membranes.
4. **Computational Modeling Techniques:** These techniques help simulate the physical and chemical processes within biological membranes and interpret data extracted from experiments.

5. Optical Control Techniques: As mentioned in the previous text, these techniques are used to directly manipulate the structure of biological membranes and understand how it affects the development of Alzheimer's

## **Discussion:**

Studying biophysical physics of biological membranes plays a crucial role in understanding Alzheimer's disease, by contributing to understanding the molecular structure of cellular membranes and the effects of genes and environmental factors on disease progression. It also helps understand the interactions of proteins and lipids within membranes and the impact of Alzheimer's disease on them. Additionally, it provides analytical tools enabling the study of precise chemical and physical reactions, thus aiding in the development of new treatment strategies for Alzheimer's disease.

## **Conclusion:**

The expected results from these studies could contribute to obtaining detailed insights into how cell membranes interact with proteins involved in Alzheimer's disease pathways. These results are anticipated to enhance our understanding of the formation of connections between proteins and biological membranes, and how these connections can play a role in the formation of the persistent plaques that accumulate in the brains of Alzheimer's

patients. Additionally, these anticipated results could guide us towards exploring new ways to treat Alzheimer's disease, such as developing treatments that effectively target the interactions between proteins and biological membranes. In general, the research results in the field of biophysical physics of biological membranes are expected to expand our understanding of Alzheimer's disease and provide new perspectives for developing treatments and prevention methods.

### **Recommendations:**

Based on the expected results of these studies, the following conclusions and recommendations can be made for future research in this field:

1. Further investigations should focus on elucidating the specific mechanisms by which proteins interact with biological membranes in the context of Alzheimer's disease. This will help in identifying potential therapeutic targets for intervention.
2. Future studies should explore the impact of environmental factors on the interactions between proteins and biological membranes, as these factors can influence the progression of Alzheimer's disease.
3. It is recommended to investigate the role of lipid composition and structure in modulating protein-membrane interactions, as this can provide valuable insights into the pathogenesis of Alzheimer's disease.
4. Collaborative research efforts between biophysicists,

neuroscientists, and clinicians are essential to translate the findings from biophysical studies into clinically relevant applications for the diagnosis and treatment of Alzheimer's disease.

5. Longitudinal studies are warranted to assess the long-term effects of targeting protein-membrane interactions as a therapeutic strategy for Alzheimer's disease, and to evaluate the efficacy and safety of potential interventions.

By addressing these research gaps and recommendations, future studies can advance our understanding of the biophysical aspects of Alzheimer's disease and pave the way for developing innovative therapeutic approaches.

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