

The Importance of Tau Phosphorylation for Neurodegenerative Diseases

Mahendra Dwivedi ^{1*}, Jahnvi .R ²

¹ RKDF School of Pharmaceutical Science, Bhopal, Madhya Pradesh, India

² Department of Biotechnology

*Corresponding Author Email: mahendradwivediji@gmail.com

Abstract

Tau phosphorylation indicates the pathology features of several neurodegenerative diseases such as Alzheimer's disease and frontotemporal dementia that reflect the presence of an end-staged neurofibrillary lesion. This factor determines the alteration of soluble tau protein in the neurodegeneration process and influences the tau structure, distribution, and function in the neurons. The cytosol protein is related to microtubules and regulates external transport in demonstrating additional functions of DNA stabilization and synaptic function. This factor helps to examine the test spread of tau pathology in the disease model for understanding the potential role of extracellular tau in the cell signal in pathways for the neurodegeneration process. Significant heterogeneity had been described between various tauopathies that deposit tau in pathological lesions in mass spectrometric analysis. The caspase cleavage tau fragment assists to determine the effective region of the tauopathy brain in humans for seeding nidus for the promotion of aggregation and fibrillation of full-length tau species.

The progression of neurodegenerative disease reflects the promotion of environmental and genetic factors that indicate serine, tyrosine, and threonine in tau phosphorylation. This element is used to change the structure of tau protein in the human brain and affected the communication between the brain and other human organs due to the death of neurons. The secondary data collection is utilized in this study by collecting details from journals and research articles related to the aggression of tau protein and phosphorylation in promoting neurodegenerative disease. The objective and aim of the study are to identify the impact of tau protein on neurodegenerative disease and its influence on the human brain.

Keywords

Caspase Cleavage, Neurodegeneration, Neurofibrillary Lesion, Tau Phosphorylation, Tau Protein.

INTRODUCTION

Million number of people are affected by neurodegenerative disease. Human cells of the brain are mostly affected by this disease and as a result function of the nerve system is damaged. This disease takes a long time to destroy the functionality of brain cells and nerve system. Effect of neurodegenerative disease is increased on the brain cells and this progression promotes damaging functionality of the cells. Impact of neurodegenerative disease is enhanced among patients by age and for this reason old aged people are mostly victims of this disease. In most of the cases, Brian cells die due to this disease. Even neuron cells die due to neurodegenerative disease on the human brain and nerve system. Genetic issues and tumor stroke are mostly the causes of occurring neurodegenerative disease. Drinking huge amounts of alcohol is also an important cause of neurodegenerative disease.

Alzheimer's and Parkinson's are the common diseases which have occurred due to neurodegenerative disease. Control capability of the human brain is affected due to these diseases and for this reason regular balance of human beings are affected. Others such as much more mental stress, depression have a huge impact on damaging brain cells that increase the possibility of neurodegenerative disease. Tau protein plays an important role in causing this disease in the

human brain. Progression of tau protein affects the entire activities of neuron cells. Tau protein shows aggressive attitude on the brain through its structure. In research it is found that the molecule of tau changes its structure as a paperclip. The paperclip structure prevents tau from increasing its structure and when this structure is broken, molecules of tau are neutralized that promotes self-assembly. This condition of tau promotes aggression in brain cells. Tau phosphorylation is about the various proteins which are responsible for causing Alzheimer's and Parkinson's.

LITERATURE REVIEW

Impact of tau phosphorylation on risk of neurodegenerative disease through drinking water

Industrial revolution has a vital role for damaging human health. Mostly heavy metal, arsenic from various industrial sources come and add in the sources of drinking water. Arsenic has much more availability in most of the group water sources. It is considered as the 10th chemical which has a huge bad impact on human health as per the WHO report of WHO. In a report it is found that around 140 million people drink arsenic mixed water from almost 50 countries worldwide [1]. Metabolism is considered highly toxic for human organs and different kinds of short-term health related issues such as vomiting, nausea, muscle weakness and diarrhea happen. High level arsenic is responsible for some

serious health issues such as damages of kidney, liver, bladder. Tau is from the family of such protein which has an aggressive attitude on brain cells and for this reason multiple nerve related issues have occurred.

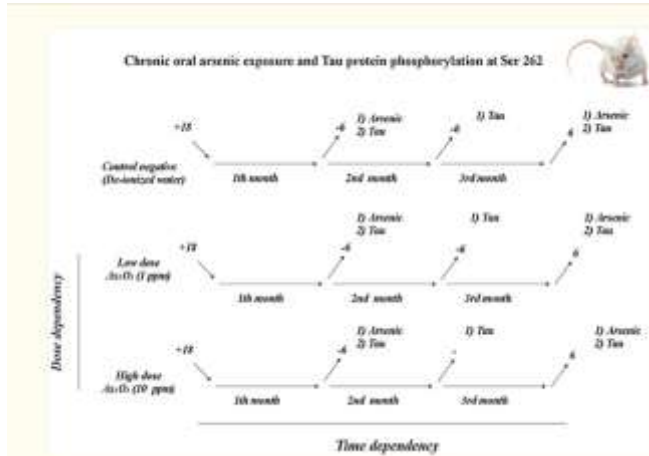


Figure 1. Effects of arsenic on tau protein
(Source: [1])

In research it is found that tau phosphorylation is responsible for 80% of diseases which occur due to aggressive structure of tau. On the observation of research, it is found that increasing measurement of arsenic promotes enhancement of tau phosphorylation in brain cells. Metabolism of arsenic helps to break the paperclip structure of tau protein that is responsible for the progressive attitude of it. After breaking the structure tau protein starts to increase its assembly in brain cells that affects neuron activities of neurons and Alzheimer's and Parkinson's are the results of this happening in the human brain. Both genetic and environmental factors are responsible for increasing the structure of tau phosphorylation on the brain that is responsible for neurodegenerative disease. Progression of neurodegenerative disease is promoted by some environmental and genetic factors [2]. Potential serine, tyrosine and threonine are present in tau phosphorylation and these elements help to change structure of tau protein in the human brain and for this reason neurons die that affect the communication between brain and other human organs.

The effect plays an important role in neurodegenerative diseases such as Alzheimer's and Parkinson's. Number of phosphorylation residuals represents the aggression of protein structure. In the developing stage of this disease, it is found that the number of phosphorylation residuals increases as per the development of disease in neurons. Presence of huge number phosphorylation residuals is noticed in brain cells in the advanced stage of neurodegenerative disease and for this reason presence of phosphorylation residuals is considered as the cause for increasing structure of tau protein and this abnormal growth of this protein helps to occur neurodegenerative diseases such as Alzheimer's and Parkinson's. Arsenic plays a vital role to increase the presence of these residuals that happens mostly through drinking water [3]. Considering the fact, arsenic included

drinking water is increasing risk for occurring neurodegenerative diseases such as Alzheimer's and Parkinson's. Capabilities of the brain are affected by these diseases that can be responsible for missing the balance of regular life.

Impact of neurodegenerative disease

Several diseases such as Alzheimer's, Friedrich, Lewy body disease, Parkinson's disease, Huntington disease and spinal muscle atrophy occur in the human body. Mainly the entire nerve system is involved in these diseases and for this reason several health issues are noticed due to this disease. Activities of the body such as movement, balance, talking, heart function and breathing are affected occurring these diseases. Alzheimer's disease is associated with activities of the brain [4]. Different kinds of changes are noticed on the brain and the changes are such low-level memory power, low thinking ability, decreasing ability of decision making, poor performance on task and changes on behavior and personality. During low memory power, people ask the same questions frequently or repeat statements more than one time that hamper personal and professional life of the people.

Important facts of conversation cannot remain and even in the advanced level the patients forget the name of family members. The conditions of Alzheimer's patients affect both professional and personal life as the patients cannot perform smoothly in family life and in professional space. Alzheimer's patients suffer from difficulties in thinking. In multiple tasking situations decision making and much more thinking ability are necessary and the Alzheimer's patients cannot think critically and make required decisions that hampers overall performance in this field. It is much more challenging to the Alzheimer's patients to deal with numbers mostly in financial management due to being unable to recognize the abstract number [5]. This situation of the patients is responsible for their poor performance in decision making that can be the reason for financial losses.

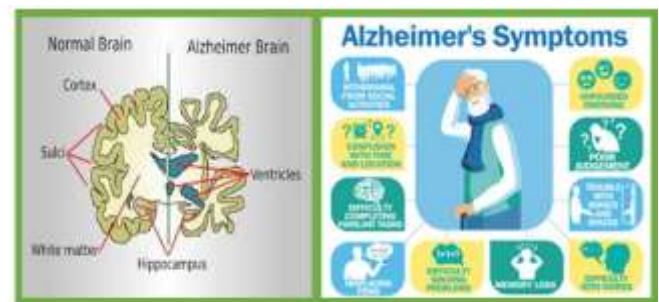


Figure 2. Stages of Alzheimer's
(Source: [5])

Ability of judgmental decision is decreased due to Alzheimer's impact on patients. Different kinds of changes in behavior and personality such as depression, less attention, social withdrawal and changes in sleeping are noticed among the Alzheimer's patients. Parkinson's disease is related to activities of the brain. This disease controls whole activities of the brain and in the advanced stage cells of the brain die.

Brain disorder is the primary impact of Parkinson's disease on humans [6]. Uncontrol movements among Parkinson's patients are noticed such as shaking, lack of balance, difficulties in talking and walking. Different kinds of health issues such as fatigue, reduced movement of food, tremor in legs, hands, stiffness of muscle, falling and irregular blood pressure can be seen among Parkinson's patients.

The patients cannot continue regular life activities due to these health issues and as a result quality of life is affected badly. In spinal muscle atrophy, activities of motor neurons are affected in the spinal cord and for this reason different kinds of issues such as muscle weakness, skeletal wasting occur in the body. Mostly the muscles of the upper legs, trunk and hand become weak due to spinal muscle atrophy disease [7]. Genetic conditions are also responsible for happening this disease among children that affects children's walk, crawl, sitting and control in head movement. Even the muscles which play an important role in swallowing and breathing can be damaged.

Impact of animal model in neurodegenerative disease

Memory loss is progressive in Alzheimer's disease that changes human behavior. In most of the cases, patients are unable to recognize friends, family members and neighbors. Ability of calculations is mostly affected due to the impact of neurodegenerative diseases such as Alzheimer's and Parkinson's. Dementia is the common reason for Alzheimer's and worldwide many people die for this disease [8]. Genetic transformation is one of the main reasons for Alzheimer's disease among most people. Different kinds of models are used to understand molecular changes in human brain cells. However, no model is able to explain the structural changes of molecules that occur in brain cells. Animal models are more effective at understanding structural changes in molecules as compared to other models. Development of animal models has provided opportunities to test genetic transformation and define therapies. Mostly, various therapies are provided to Alzheimer's patients to control progression of memory loss.

performance in testing genetic transformation of Alzheimer's disease and defining target therapies to control progression of memory loss. In the current situation, the animal model is not able to capture the genetic transformation of Alzheimer's fully, it model is better in testing as compared to other models. Several challenges are present to approach this model to understand the impact of neurodegenerative disease. Rodents are one kind of animal model and there are several challenges for modeling in neurodegenerative disease. Limited number of models are able to express genetic variance in neurodegenerative disease.

In most of the cases, it is found that the models are found invaluable to understanding the mechanism of disease. This insufficient understanding cannot define the target therapies which are beneficiaries to control the issue of memory loss. Rodents have a short life span and for this reason this model cannot make complete development on neurodegenerative representatives. Different kinds of animal models such as genetic based models that are for amyloid pathology and tau pathology. Amyloid protein is responsible for occurring neurodegenerative disease among people. Progressive attitude of amyloid protein is one of the main causes for developing neurodegenerative disease and the genetic based model of amyloid pathology is used for characteristics of amyloid protein. Progressive movement of tau protein is also responsible for causing neurodegenerative disease [10]. Genetic based model of tau pathology is used to identify the characteristics of tau protein that helps to understand required target therapies for controlling progressive of this protein.

Parkinson's is also a neurodegenerative disease and different kinds of animal models are used to define genetic transformation that is responsible for occurring this disease in humans. Pharmacologic based model and genetic based model these two types of models are used in PD to understand genetic transformation [9]. In most of the cases, it is found that drug-based therapies are more successful for the PD patients. Pharmacologic based models are more drug oriented and for this reason this model is more effective for the treatment of PD. Genetic transformation in PD is defined by a genetic based model and after understanding the transformation target therapies are decided for the patients. Other models such as Germline LRRK2 and PINK1 are also used to define conditions of PD. Frontotemporal dementia and Lateral sclerosis are also neurodegenerative diseases and different kinds of animal models such as Soon and TDP43 pathology are used to understand characteristics of protein progression.

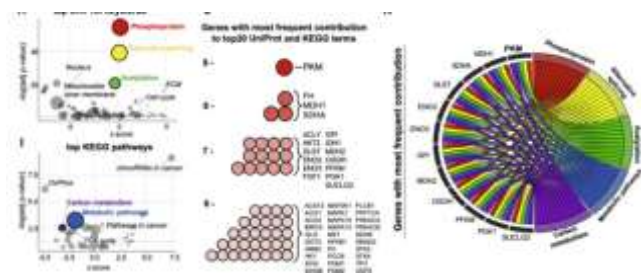


Figure 3. Network analysis of brain (Source: [8])

Therapies have ability to control this disease and for this reason in most of the cases, therapies such as CBT are provided to this kind of patients. Animal models are basically used to understand the target therapy for the Alzheimer's patients that can control progression of memory loss [9]. Many studies show that the mouse model has poor

METHODOLOGY

Research methodology is considered as a plan that is used to choose data collection methods and other research parameters. This part of study provides justification of using the parameters such as research design, philosophy and approach. Specific reasons for choosing a particular data collection method is also provided through this part. Primary and secondary data collection methods are considered for

study to collect required data [11]. Interview and survey are conducted in primary data collection and for mostly involvement of human participants is necessary in interview and survey. The entire process of interview and survey is lengthy and for this reason more time is needed as compared to secondary data collection. On the other hand, in this process of data collection more budget is required.

Human participants are involved in interviews and surveys and for this reason in many cases the possibility of bias is present in data collection that hampers effectiveness of the entire study. Online journal, article, magazine and website are the sources of secondary data collection [12]. These sources are easily available in google and google scholar and for this reason researchers have a chance to collect data from the source easily as per requirements. Wide range of data is available in those sources of secondary data that helps to collect study objective-oriented data. Researchers can easily discuss the study through the objective oriented data that helps to provide effective research outcomes. Easy accessibility of secondary data helps to reduce time consumption and less time consumption plays an important role to maintain budget and deadline of submitting. Researchers approach a secondary qualitative data collection method after considering these benefits.

In the proposed study, a secondary qualitative data collection method has been chosen for this reason. Data related to the topic has been easily collected to make discussion over the subject. The data which are collected from the secondary qualitative sources has been used in previous research and for this reason the quality of the secondary data is proven. This kind of proof increases validity of data that enhance authenticity and effectiveness of study. Acceptance of study depends on effectiveness and considering the fact secondary qualitative data has been chosen in this study to enhance effectiveness and authenticity [13]. Multiple journals and research articles have been approached to collect data for this study. Tau protein has an important role in causing neurodegenerative disease among people.

Journal and research articles related to aggression of tau protein and phosphorylation of tau have been approached. Information related to how tau protein aggression promotes neurodegenerative disease has been collected from the journal and articles. This kind of information helps to make discussion on the impact of tau protein for promoting neurodegenerative disease. Different kinds of neurodegenerative diseases such as Parkinson's and Alzheimer's have occurred among humans and the causes for occurring these disease-related information from several journals and articles have been collected [14]. Neurodegenerative diseases such as Parkinson's and Alzheimer's have different kinds of symptoms and impact on human beings.

Journal and articles related to neurodegenerative diseases symptoms and impact humans have been approached in this study to make discussion on the proposed topic. Effects of

neurodegenerative disease on human being related information has been collected from the sources of secondary qualitative data such as articles, journals and websites to discuss widely in the study. Animal model is used to detect genetic transformation on human beings that is the main cause for neurodegenerative disease [15]. Information about the impact of animal models has been gathered from the data sources and the collected information has been used in the study for discussion. The information related to the impact of animal models in neurodegenerative disease helps to understand the importance of it in different kinds of neurodegenerative diseases.

DISCUSSION

Tau is considered a microtubules protein that has progression behavior cells. This protein is associated with neurons and for this reason progression of this protein hampers activities of brain cells. However, tau is present in chromosomes that are part of the Central nerve system and several optional spices are present in the central nerve system [16]. Isolation of these alternative species contains amino acid and in the construction of protein amino acid has an important role. This kind of construction helps to promote posttranslational modifications in the Central nerve system. Tau phosphorylation is one kind of posttranslational modification that has progression behavior. Abnormal protein formation happens in Brian cells that affect the activities of brain cells and for this reason neurodegenerative disease happens. Alzheimer's and Parkinson's are the main neurodegenerative diseases which have occurred due to abnormal protein formation in brain cells.

Neurodegenerative disease happens mostly due to genetic transformation. In recent research it is found that metal such as arsenic is also responsible for causing this disease in human beings. Arsenic increases structural modifications of the protein that is phosphorylation. Molecular structure of arsenic promotes abnormal protein formation in the Central nerve system and for this reason entire activities of the nerve system are affected. Arsenic comes into the human body mostly from drinking water [17]. People from various countries are consuming arsenic through drinking water and for this reason the possibility of neurodegenerative disease is also increasing among the people. Alzheimer's and Parkinson's are the main diseases of neurodegenerative diseases that have different kinds of impact on human beings. Other diseases such as lewy body disease, Friedrich and Huntington are involved in neurodegenerative diseases for which abnormal modifications of protein are responsible.

Several symptoms such as slow movement, poor heart function and breathing issues are happening among the neurodegenerative disease affected patients. Whole nerve system is badly affected by this disease and for this reason human activities that are controlled by the nerve system are affected. Memory loss issues are significant for these kinds of patients. This mental issue is progressive and for this reason the patients lose the ability to identify a particular object,

friends and even family members. Several times, similar questions or statements are asked by the patients frequently and the patients cannot remember the statement clearly. These health conditions of people hamper both personal and professional life. Ability of critical thinking is decreased and for this reason different kinds of issues are faced by the patients during making decisions. In professional space making effective decisions is necessary to show capabilities in jobs [18]. In this situation mostly the patients cannot provide better performance in professional space.

Professional life is badly affected due to the bad impact of neurodegenerative disease among human beings. Age is considered one of the most important risk factors for this kind of patient. Impact of neurodegenerative increase with age and for this reason the effects of health issues is also increased. Health disorders such as memory loss, slow movement and issues in walking are increased as per aging. Alzheimer's, Amyotrophic, Huntington and Ataxia are the main neurodegenerative diseases [19]. Difficulties in speaking is one of the important symptoms of aged Alzheimer's patients. These kinds of patients cannot speak smoothly and as a result interaction with other people is affected. Ability of learn is also hampered due to Alzheimer's.

Genetic issues, head trauma and vascular disease are the risk factors of this disease and abnormal modifications of tau protein are responsible for these risk factors. Amyotrophic disease has several symptoms such as muscle weakness and motor defects that lead to decreased physical strength of human beings [19]. Physical movement of humans is affected badly and for this reason patients cannot continue their regular activities that are happening due to muscle weakness. Abnormal protein formation is responsible to affect entire activities of brain cells and for this movement of muscle is affected. Age is also responsible for increasing these risk factors among the patients as in most of the cases, abnormal protein formation rises with aging and for this reason the capability of brain cells to control the human body is decreased.

From several studies it is found that animal models have developed to understand genetic transformation of neurodegenerative disease and identify the target therapies for the neurodegenerative patients. Most people are affected by Alzheimer's and Parkinson's diseases due to genetic transformation and animal models are used to determine characteristics of genetic transformation. Therapies can control effects of neurodegenerative disease and for this reason identify the required therapies is necessary for the patients. Therapy such as CBT is used for Alzheimer's patients to control the issue of losing memory [20]. The therapy is targeted by using animal models for neurodegenerative diseases. However other models such as the mouse model are also used to define characteristics of genetic transformation and mostly this model is ignored due to its poor performance.

CONCLUSION

Tau phosphorylation is an abnormal modification of tau protein that affects brain cells. This effect is responsible for decreasing the ability of operating the entire nerve system. Neurodegenerative diseases are causing this abnormal tau protein formation. Characteristics of neurodegenerative diseases is progressive and for this reason health issues among the patients rise with time. Impact of neurodegenerative diseases also increases among human beings and for this reason symptoms among the patients also risen. Losing memory power, muscle weakness, difficulty in speaking and low-level thinking ability, these health issues increase among the patients with aging. Ability of physical work is decreased due to muscle weakness and mostly the patients depend on others for regular physical activities.

Performance of professional is badly affected due to poor thinking ability and mostly these kinds of people cannot make effective decisions. In most cases it is found that memory loss people are unable to identify family members and friends that hamper personal life. Several studies show that animal models have developed to understand genetic transformation. This identification helps to define which therapies are effective for the patients to control memory loss issues. Therapy can control memory loss issues of neurodegenerative patients and for this reason it is necessary to identify the effective therapy that is able to control it. CBT therapy is considered highly effective for neurodegenerative patients to control progression of memory loss. Several challenges are found to use this model in case of considering its benefit and it is more useful for the patients.

Tau reflects the progression of behavior cells that are related to neurons and the progression of hampering activity in brain cells. This factor helps to present the chromosomes of the central nervous system and optional species present in the central nervous system that contains amino acid in the construction of protein amino acid effectively. On the other hand, the findings of the animal model help to understand the genetic transformation in neurodegenerative disease and identify the targeting therapies for the patients. Alzheimer's and Parkinson's disease creates genetic transformation and helps to determine the characteristic of genetic transformation with the animal model for developing the therapy and analyzing the requirements of the patients. CBT therapy helps to control the issue of losing memory and reduce the challenges of neurodegenerative diseases and develop the offering of healthcare services. However, this therapy shows poor performance in understanding the characteristic of genetic transformation that causes errors in the treatment procedure for targeting therapy process.

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