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Neuroprotection And Neurodegenerative Diseases – A Review Article

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ABSTRACT
This paper will focus on neuroprotective effects of various drugs such as beta blockers and various natural products in the treatment of neurodegenerative disorder. We can define neuroprotection refers to recovery or regeneration of the nervous system, its cell, structure and function. Various neurodegenerative disorder such as Alzheimers disease which is characterized by progressive neuronal loss which can be treated with neuroprotective effects of beta blockers in a preclinical model of neurodegenerative disorder. Neuroprotective effects of various drugs are available only for limited indications. Development of new drugs require evaluation in animal studies, and human clinical trials. By the help of various natural products and suitable drug dosage neurodegenerative disorder can be improved. With few available treatments, Neurodegenerative illnesses are distinguished by a steady loss of neurons, as well as mental decline- present a serious threat to public health. Beta- blockers, commonly used to manage cardiovascular conditions, have been suggested to possess neuroprotective properties through their modulation of various cellular pathways implicated in neurodegeneration .While current treatment options primarily manage symptoms, the search for therapies that can slow or prevent disease progression remains a critical area of research. High blood pressure is treated with a class of medications known as beta blockers commonly administered, have emerged as potential candidates with neuroprotective properties.

Keywords : Neurons, Beta blockers, Alzheimer's disease, Natural products, neuroprotective,neurodegenerative disorder, Clinical trials.

1. INTRODUCTION

Neuroprotection can be defined as recovery of the nervous system including its cells,structure and various functions. Here, we discuss about various drug therapy such as ARBs are neuroprotective and have potential therapeutic use in many brain disorder(2). When administered systematically, ARBs enter the brain and improve cerebral blood flow and thereby maintaining blood brain barrier function, neuronal injury in animal models of stroke etc .Neuroprotection is conceived as one of the potential tool to improve neuronal loss and hence it is a therapeutic hope to treat neurodegenerative disease such as Alzheimer's disease, parkinson's disease etc. Neuroprotective effects of beta blockers have also potential effect on loss of neurons. Beta blockers improve traumatic brain injury, that a daily dose of propranolol can improve memory, learning and improves cognitive function. It might beneficial in improving cognitive memory impairements.

Nonselective beta and alpha1 blocker (carvedilol) with additional effects as an antioxidant, anti-inflammatory and having neuroprotective properties. Neurodegenerative diseases are among the most serious health problems affecting millions of people worldwide, and there incidence is dramatically growing together with increased life span. Current research on such as natural products that improve cognitive impairment and neuronal loss. Among the huge number of polyphenols, several epidemiological studies have specificially highlighted the potential beneficial role if flavanoids or other natural product to counteract neurodegeneration. Alzheimer's disease, discovered by Dr. Alois Alzheimer in 1906, is currently the number one chronic neurodegenerative disease, affecting more than six million people in the US about 50 million people worldwide. Natural products and their isolated compounds have been extensively studied, to develop more effective drugs for the treatment of AD.

Although the whole of experimental data indicating the neuroprotection can be achieved is remarkable and encouraging, no firm data have been produced in humans so far and at the present time, neuroprotection still remains a challenge for the future. This study aims to clarify the process behind beta blockers mediated neuroprotection and evaluate their translational potential for therapeutic use in the treatment of neurodegenerative illnesses by extensive behavioral, histological and biochemical investigations. Due to their capacity to treat cardiovascular diseases like cardiac failure and hypertension, beta blockers, a class of medications have emerged as intriguing candidates for neuroprotective therapy, to

modulate neurotransmitter release, attenuate neuroinflammation and enhance cerebral blood flow. Scientists and philosphers have noted that the same ingredients that make up ordinary soil and water also make up humans and other animal life. However, the human body is one of the most complex things on the planet and an endless source of both wonder and mystery when these fundamental components come together in thousands of various ways to build it. Abnormalities in any normal functioning of body to maintain the homeostasis result in disease or disorder affecting individual's health.

1.1 Classification of Neurodegenerative Diseases

Neurodegenerative diseases can be classified based on several criteria, including the predominant clinical symptoms, underlying neuropathological features and genetic etiology.

1, Alzheimer's Disease (AD): The disease's characteristics include progressive cognitive decline, memory loss and difficulties with day to day functioning.

2. Parkinson's Disease (PD): It is typified by stiffness, tremors, bradykinesia and postural instability as motor symptoms. It causes unintended or uncontrollable movements which leads to difficulty in walking and talking.

3. Hungtington's Disease(HD): It causes cognitive decline, motor abnormalities and mental health issues. An increase in HD is brought on by CAG repeats in the huntingtin (HTT) gene.

4. Amyotrophic Lateral Sclerosis(ALS): From a neuropathological perspective, motor neurons in ALS exhibit cytoplasmic inclusions such as TDP-43 protein aggregates and bunina bodies.

5. Frontotemporal Dementia (FTD); A collection of illnesses collectively referred to as FTD are marked by a progressive deterioration in language,behaviour and executive function.

6. Prion Disease: Abnormal folding of prion proteins causes prion disorders such as variant CJD (vCJD) and Creutzfeldt-Jakob disease (CJD), which are defined through the brain's build up of prion aggregates.

1.2 Neurotrophins, **neuroprotection and the blood brain barrier**(**BBB**)

The BBB is intact in the initial hours after acute stroke when neuroprotection is still possible, becoming disrupted at 4 to 24h after an acute stroke, but by this time neuroprotection is no longer possible. So, molecules must be reformulated to enable transport across the BBB in pharmacologically significant amounts. Blood brain barrier dysfunction is common in most brain disorder and is associated with disease course and delayed complications.

Current views and prospects: causative factors of neurodegenerative disease is still remain largely unknown. Ageing is considered as a major risk factor because of the increased incidence of the diseases with age.

Risk factor: Known risk factors for neurodegenerative disease include certain genetic polymorphisms, oxidative stress, inflammation, diabetes, hypertension, poor education etc.

Challenges: such as clinical challenges, in research when we use various methods for trials there is very limited clinical application of therapies that have shown effectiveness in various animal models of acute neurodegeneration.

2. Understanding Beta Blockers Neuroprotective Effects: **Preclinical Insights into Neurodegenerative Diseases**

"Understanding Beta Blockers Neuroprotective Effects: Pre-clinical insights into Neurodegenerative Diseases" delves into a comprehensive exploration of beta blockers potential to safeguard neurons within the framework of neurodegenerative condition. Given the lack of disease- modifying treatments, investigating alternative therapeutic avenues becomes imperative. Beta blockers, traditionally employed for managing cardiovascular conditions, have recently emerged as intriguing candidates for neuroprotection due to their ability to modulate various neuro biological pathways. By gaining a deepeer understanding of beta blockers neuroprotective effects in pre-clinical models, researchers pave the way for potential translation into clinical practice. These pre-clinical insights inform the design of future clinical trials aimed at assessing the effectiveness and safety of beta blockers in treating neurodegenerative disorders in people. In the end, these kind of studies could lead to the creation of new treatment approaches that will lessen neuronal deterioration and enhance the lives of those who suffer from these crippling conditions.

2.1 Methods:

By the help of various in vitro and in vivo model which helps in cognitive impairment and neuronal loss of various neurodegenerative disorder such as Alzheimer's disease, parkinson's disease, Amytrophic lateral sclerosis reduce neuroinflammation etc. By using various preclinical model , experimental mice were reared and produced under a 12 hour light\dark cycle in animal house facility by following ethical committee and by using proper treatment protocol by the suitable route of administration which results in improved cognitive function. As we see that All experimental mice were housed and everyone had access to water and food. CPCSEA (Committee for the control and supervision of animal experiments) requirements were followed in the execution of all procedures and experiments employed in the study, which were authorized by the IAEC. First, we have to select suitable preclinical model, their housing and care and disease induction in a suitable model. Then we design experimental groups with careful consideration given to age, sex and baseline cognitive function. Then we select proper treatment administration to the treatment group via various routes, dosage and duration are determined based on previous studies, pharmacokinetic considerations.

2.2 The effect of beta blockers in a preclinical neurodegenerative disorders:
. Reduced Neuroinflammation
. Attenuation of beta blockers in oxidative stress
. Modulation of Neurotransmitter systems
. Enhancement of cerebral blood flow
. Inhibition of Excitotoxicity
. Drug Development
. Therapeutic Optimization

3. Discussion: By the help of proper treatment protocol showed significant improvements in cognitive performance beta blockers such as propranolol shown promise in protecting against neurodegeneration in Alzheimer's disease animal models by the reduction of neuroinflammation and amyloid beta aggregation. Histological analysis revealed a decrease in amyloid plaque density of propranolol treated mice, shows potential neuroprotective effects of propranolol against alzheimer's. Propranolol exerts neuroprotective effects and act as a treatment protocol of various neurodegenerative disorder. Propranolol treated mice show improved cognitive function, reduce amyloid beta and tau pathology. We can say that in propranolol treated mice, the desired outcome is improved performance in memory and learning tasks. This suggests a potential benefit for cognitive decline associated with Alzheimer's.Propranolol can be administered orally by mixing it with food or water or through injections. The chosen method depends on the study design and desired control over dosage. Beta blockers could potentially reduce the aggregation of harmful proteins like beta-amyloid plaques or enhance their clearance through the glymphatic system, a brain waste disposal mechanism .Beta blockers might protect neurons from programmed cell death by modulating signalling pathways or improve mitochondrial function by enhancing energy production or reducing oxidative stress within these cellular powerhouses.

Future scope: By focusing on both cellular and functional outcomes,and acknowledging the limitations of pre clinical models,this line of research canopen the door for cutting-edge treatment approaches for neurodegenerative disorders like AD.

4. Conclusion: This review demonstrates the potential neuroprotective effects of various drugs such as beta blockers, angiotensin receptor blocker and various natural product in the treatment of neurodegenerative disorder. Treated group mice show improved cognitive function, reduce amyloid beta and tau pathology. Beta blockers might dampen the inflammatory response in the brain, a contributing factor in Alzheimer's progression. Beta blockers may complement existing neuroprotective strategies or medications leading to enhaced therapeutic outcomes. Combination therapies targeting different pathways could offer synergistic benefits in combating neurodegeneration. Propranolol exerts neuroprotective effects and act as a treatment protocol of various neurodegenerative disorder. These findings warrant further investigation in clinical studies to confirm the effectiveness and security of beta blockers in treating neurodegenerative disorders and potentially improving patient outcomes. Overall, this study findings offer strong support for propranolol's neuroprotective properties in pre-clinical models of neurodegenerative diseases. Propranolol has promise as a potential therapeutic intervention for neurodegenerative illnesses due to its ability to preserve neuronal integrity, reduce pathogenic burden and modulate molecular pathways linked with neuroinflammation and oxidative stress.

4.1 Beta blockers may
. Reduce neuroinflammation, preserving cognitive function.
. Enhance mitochondrial function, promoting neuronal viability.
. Facilitate protein clearance, reducing aggregation and toxicity.
. Modulate microglial activation towards a protective phenotype.
. Improve Blood brain barrier integrity, limiting neurotoxic infiltration.

POSSIBLE SIDE EFFECTS
. Lower blood pressure
. Dizziness or fatigue

OTHER ADVERSE EFFECTS
. Slow heart rate (bradycardia)
. Cold hands and feet
. Sleep Disturbance.

5. Summary of the statement of problem: Degenerative illnesses pose a serious and expanding threat to public health, worldwide, with limited therapeutic options available to effectively slow or halt their progression. Beta blockers, primarily known for their use in cardiovascular conditions, have demonstrated potential neuroprotective properties in preclinical studies, suggesting they may hold promise as a treatment avenue for neurodegenerative diseases. However despite these

initial findings, There is still a significant knowledge vaccum on the specific mechanisms, by which beta blockers exert their neuroprotective effects, as well as their overall efficacy in mitigating neurodegeneration. Through a combination of behavioral assessments, histological analyses and biochemical assays, the study seeks to elucidate the specific neuroprotective mechanisms underlying beta blockers action, including their potential to reduce neuroinflammation, oxidative stress and neuronal damage. The challenge is figuring out how a particular class of beta blockers might guard against neurodegeneration disorders in preclinical studies.

Key aims of evaluating beta blockers for neuroprotection in pre-clinical models:

1. Assess the efficacy of beta blockers in preserving neuronal health and mitigating neurodegeneration.
2. Elucidate the underlying mechanisms through which beta blocker exert neuroprotective effects.
3. Evaluate the safety profile and potential adbverse effects of beta blockers in neurodegenerative contexts.
4. Explore the potential synergistic effects of beta blockers with existing neuroprotective interventions.
5. Lay the groundwork for the translation of beta blockers into effective treatments for neurodegenerative diseases.

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