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Caffeine as Protective Factor in Alzheimer Disease

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Abstract

Caffeine has well-known short-term stimulating effects on central nervous system, but the long term impact has been more unclear .Alzheimer's disease (AD) neurodegenerative disease is the most common cause of dementia in the elderly. Thus, the protective effects of caffeine against dementia/AD are of great interest. Here We have utilized a transgenic mouse model for AD in well controlled studies to determine in caffeine, and coffee have beneficial actions to protect against or reverse AD like cognitive impairment and AD pathology. AD mice given caffeine in their drinking water from young adulthood into older age showed protection against memory impairment and lower brain levels of the abnormal protein (amyloid-β; Aβ) thought to be central to AD pathogenesis. coffee provided to AD mice also quickly decreased plasma Aβ levels, Caffeine appears to provide its disease-modifying effects through multiple mechanisms, including a direct reduction of Aβ production through suppression of both β- and γ-secretase levels. most studies support coffee's favorable effects against , dementia or AD . In the CAIDE study, coffee drinking of 3–5 cups per day at midlife was associated with a decreased risk of dementia/AD by about 65% at late-life. In conclusion The therapeutic benefits of caffeine consumption against Alzheimer disease are apparent from various recent research studies .this finding might open possibilities for prevention or postponing the onset of Alzheimer disease.

Introduction

The caffeine is present in many dietary sources consumed around the world i.e in coffee, tea, cocoa , The short term central nervous system stimulating effects of caffeine are well known , but the long term impact has been more unclear , low to moderate doses of caffeine (50_300 mg) Cause the most notable behavior effects including increased a alertness , energy and ability to concentrate , but higher doses can cause negative effect such as anxiety , restlessness insomnia and tachycardia.(1)

The Alzheimer disease is progressive or irreversible neurodegenerative disease is the most common cause of dementia in the elderly . the disease usually become clinically apparent as memory loss , with alteration in mood and behavior , language dysfunction , aphasia indicate severe cortical dysfunction .death usually occurs from inter-current pneumonia or other infection . when considered by age groups , the incidence of Alzheimer disease is 3% for individuals 65 to 74 years old , 19% for 75 to 84 years or more . most cases are sporadic , a though at least 5% to 10% of cases are familial . In general , patients rarely become symptomatic before 50 years of age ,by early onset can be seen with some of the heritable forms. (2)

There's many factor that help in development of the disease like ; age which is the strongest risk factor for Alzheimer's , as you grow older the likelihood of developing AD increase, the family history and genetics your risk of developing AD is somewhat higher if a first-degree relative your parent or sibling. The down syndrome ,sex , mild cognitive impairment ,past head trauma , poor sleep patterns ,and the lifestyle and heart health. .(3)

The pathogenesis is evidence from familial forms of the disease indicates that accumulation of a peptide (amyloid-β; Aβ) in the brain initiates a chain of events that result in the morphologic change of AD and dementia. This peptide is derived from a larger membrane protein known as Amyloid Precursor Protein (APP) , which is

processed in either of two ways . it can be cleaved by two enzymes (alpha secretase and γ-secretase), in a process that prevents formation of Aβ , or it can be cut by β – site APP-cleaving enzyme and γ-secretase to generate Aβ.generation and accumulation of Aβ occur slowly with advancing age . AD by increasing the rate at which Aβ accumulates. AD occur in almost all patient with trisomy 21(down syndrome) . the search for genes associated with typical ,sporadic Alzheimer disease is beginning to identify genetic associations that may provide new clues about the pathogenesis of the disease. An allele of apolipoprotein , called (E4) (APOE4), is associated with as many as 30% of cases , and is thought to both increase the risk and lower the age of onset of the disease . another gene , called SORL1,has recently been found to also be gene associated with late-onset Alzheimer disease , deficiency of the SORL1 protein may alter the intracellular trafficking of APP. Accumulation of Aβ has several effects on neurons and neuronal function .small aggregates of Aβ can alter neurotransmission ,and the aggregates can be toxic to neurons and synaptic ending ,larger deposits , in the form of plaques ,also lead to neuronal death.(2)

The Alzheimer's disease is neurodegenerative disease leads to progressive cognitive decline and the accumulation of β _amyloid peptide in the brain , and the mechanism of caffeine in Alzheimer disease is not known but caffeine produced neuroprotective effect against amyloid beta neurotoxicity. Which Lead to reduce In amyloid-beta In brain .and it leads to delaying the onset and development of dementia .(4)

The aim of study to review the important discoveries that have been recently and present the possible mechanisms behind the neuroprotective effects.

Material and method

A literature search was performed to discover studies reviewing the correlation between caffeine and Alzheimer's , online sites and databases included in this report are pubmed database , and the American society of clinical oncology for relevant reports . search terms included "caffeine and Alzheimer's" "caffeine and coffee as therapeutics against AD", "caffeine as protective factor in dementia and AD" and "caffeine consumption "

In this study, when they put caffeine into the drinking water of Amyloid *B*eta Protein Precursor (A*B*PP) transgenic (Tg) mice between 4 and 9 months of age (300 mg/L). The resultant amount of caffeine intake for each mouse (approximately 1.5 mg/day) was the human equivalent of 500 mg or 5 cups of coffee per day. Cognitive testing in a comprehensive battery during the final 6 weeks of treatment revealed surprisingly better performance of Tg mice being given caffeine compared to control Tg mice given non-caffeinated water .

Result

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Discussion

In first study indicate a surprising ability of moderate caffeine intake to protect against or reverse AD-like cognitive impairment and Aβ neuropathology in established mouse models for AD. The equivalent amount of daily caffeine intake that our studies suggest is required for human therapeutic benefit against AD is approximately 500 mg. The average US intake of caffeine is only around 150 mg/day and decreases during aging – thus, average caffeine intake appears to be significantly below levels necessary for benefits against AD . As such, only five cups of coffee per day (a moderate consumption level) are needed to reach the 500 mg level. (5)

the CAIDE study indicated that moderate coffee (3–5 cups/day) consumption at midlife was associated with a decreased risk of dementia and AD by about 65% in late-life. Tea consumption, however, showed no association with dementia or AD in the CAIDE-study population. (1)

Caffeine is a nonselective A1 and A2*a* adenosine receptor antagonist, and thereby it stimulates cholinergic neurons . It has been shown in mice that both caffeine and adenosine A2*A* receptor antagonists prevent amyloid-β induced cognitive deficits . Interestingly, a recent study suggested that caffeine reverses cognitive impairment and decreases brain amyloid-β levels in aged AD mice . Chronic caffeine administration has shown to have neuroprotective effects in the experimental models of hypoxia and ischemia, also related to caffeine action as adenosine receptor antagonist . (1)

Conclusion

The therapeutic benefits of caffeine consumption against Alzheimer disease are apparent from various recent research studies .this finding might open possibilities for prevention or delaying the onset of dementia / Alzheimer disease.

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