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Effect of Coffee in Improvement of Alzheimer's disease

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Date of submission: 14 \4\2018

This report is submitted to fulfill the requirement for 3rd year.

Abstract

- The therapeutic benefits of coffee consumption against AD are apparent from various recent research studies
- Research indicates that caffeine in the diet is linked to the reduction of hyperphosphorylated tau and can reduce the severity of AD symptoms
- Caffeine is a non selective adenosine A2A receptor antagonist
- The A2A receptor is also expressed in the brain, where it has important roles in the regulation of glutamate and dopamine release, making it a potential therapeutic target for the treatment of conditions such as insomnia, pain, depression, and Parkinson's disease.

Introduction

- Caffeine, the principal alkaloid in coffee, tea, and energy drinks, is one of the most consumed psychoactive substances in the world
- Studies suggest that coffee consumption affects health-related variables such as cancer, exercise performance, diabetes, and blood pressure. Caffeine has been shown to affect multiple aspects of the central nervous system,
- And influence in e.g. memory improvement⁸, mood improvement, increase in overall metabolism in the brain¹, and motor neuron stimulation.
- Regular consumption of coffee/caffeine has been linked with Alzheimer's Disease recent study due to its effect in memory improvement
- Alzheimer's disease (AD) a progressive neurodegenerative disease that destroys memory and other important mental functions
- drug and non drug treatments can only slow the progression of the disease. For this reason, more needs to be learned about this disease to create better prevention and treatment options.
- The current research indicates that most cases of AD are sporadic (not genetically related) but approximately 5% are considered familial AD
- Many epidemiological studies have been conducted on the treatment of Alzheimer's that suggest enhanced coffee/caffeine intake during aging reduces the risk of AD. As one of most popular beverages in the World, many experimental studies have been done to test the effects of coffee consumption on AD. This paper will aim to review the important discoveries that have been made recently and present the possible mechanisms behind the neuro protective effects. ^{1,2}

Method

- This method is based on Two studies ,a 1st study is performed in
 - ✓ Received :03 April 2017 , Accepted: 23 August 2017 ,Published online: 23 August 2017 Gene expression differential analysis was performed for samples from each time point and each caffeine concentration compared to 0 h controls with no caffeine added
 - ✓ And another one performed in February 2018

Discussion

- I compared between two studies on the effect of coffee in Alzheimer's disease

First study

- based in recent study in **2011** study by Dr. Cao et al. was conducted using transgenic AD mice
- to differentiate the effects of caffeinated coffee and decaffeinated coffee against AD
- The treatment in this study included 200 μ l i.p injection of saline, caffeine, un-concentrated coffee (0.15 mg/100 μ l), concentrated coffee (0.75 mg/100 μ l) and concentrated decaffeinated coffee (0.03 mg/100 μ l)
- The cytokines in pre/post-treatment blood were measured
- the post-treatment blood showed significant increase in cytokine (G-CSF, IL-10 and IL-6) levels of concentrated and un-concentrated coffee
- In the 3 month long-term study, the same treatment groups were given to AD transgenic mice, only un-concentrated and concentrated coffee was able to improve performance
- The improvement in cognitive performance was also directly associated with the increase in levels of plasma G-CSF, which has been linked to a protective signaling mechanism in response to neural injury
- Role of G-CSF and how it functions: Consumption of coffee has been linked to an increase in levels of plasma Granulocyte colony-stimulating factor (G-CSF). stimulates neurogenesis, and promotes bone marrow to produce granulocytes and stem cells. Human G-CSF has been used for treatment of neutropenia and mobilization of hematopoietic stem cells (HSC) from bone marrow
- G-CSF stimulates other cells to provide the protective benefits against neuronal apoptosis
- G-CSF is produced by the immune cells in the human body. Receptors of G-CSF have been found in bone marrow and in the central nervous system
- Deficient levels of G-CSF reduce the hematopoietic brain support against progression of AD pathogenesis
- The results from this study suggest that caffeine synergizes with an unknown compound from coffee to provide benefits against AD and its progression
- in other study in **2014** study discovered that caffeinated coffee had higher levels of 37 metabolites and decaffeinated coffee had higher levels of 32 metabolites. This study suggests that the prominent therapeutic benefits of caffeinated coffee over decaffeinated coffee¹

Second study

- Show At a concentration of 1–30 μ M in the body (ingestion of 1–5 cups of coffee) the primary effect of caffeine in the central nervous system is inhibition of adenosine receptors and subsequent modulation of neurotransmitter release.
- Adenosine, a neuro-modulatory signaling molecule, is normally present in the brain, and when it accumulates e.g. during increased neuronal firing, it causes a progressive decrease in neuronal activity when bound to adenosine receptors.

- Caffeine counters this effect by acting as an antagonist at the adenosine receptors A1 and A2A1.
- By preventing adenosine from binding
- caffeine increases neuronal activity, leading to downstream stimulatory effects on the neurons.
- At supraphysiological concentrations (>100 μM), caffeine inhibits GABAA receptors, reducing the inhibitory input in functional neuronal networks, inhibits phosphodiesterase activity leading to increased cellular cAMP levels, and releases Ca^{2+} from intracellular ryanodine sensitive stores stimulating Ca^{2+} signaling in numerous cell types including neuron
- Also At the gene-regulatory level, caffeine modulates CREB-dependent gene expression and induces immediate-early genes (IEGs)
- . IEGs are transiently expressed and have long been used as biomarkers for neuronal activation.
- Caffeine has been shown to increase the expression of IEGs ²

Conclusion

- ✓ The therapeutic benefits of coffee consumption against AD are apparent from various recent research studies.
- ✓ Study shows an inverse relationship between coffee consumption and risk of AD.

References

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2. Coffee and its Consumption: Benefits and Risks | Request PDF. (n.d.). Retrieved April 13, 2018, from https://www.bing.com/cr?IG=C5F2BA6F3CF047288B143A369AFC7F25&CID=38577DC695F068D202F97616945F69D7&rd=1&h=17O6tKOOetfgARKips1Nw05J6vRMWDtRiSKeAHw2uKE&v=1&r=https://www.researchgate.net/publication/50833991_Coffee_and_its_Consumption_Benefits_and_Risks&p=DevEx,5068.1