



# The Correlation Between Dopamine Level Increment and Daily Coffee Consumption

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## Abstract.

Although epidemiologic research indicates a negative relationship between coffee drinking and the development of neurodegenerative illnesses, there is ongoing disagreement on the exact amount of caffeine and roast level. This study aimed to assess the effects of caffeinated light, medium, and dark roast as well as decaffeinated instant coffee samples in tests for antioxidants and its effect on dopamine increase and general well-being based on experimental studies. Compared to decaffeinated coffee, caffeine-infused coffee, antioxidant capacity was present in all coffee samples and was unrelated to caffeine concentration. The effect of consuming coffee as needed can have the same effect as demonstrated in performing exercise activity. When methamphetamine was administered to sampled people who participated based on questionnaires, there was a good correlation between coffee consumption and dopamine level increment. The appropriate dose of coffee is able to prevent the decline in dopamine levels, and the coffee treatment did not prevent the dopaminergic neurons from substantial and eventually can have positive effects on life routine. All things considered, our findings indicate that coffee with caffeine appears to be the primary cause of these effects, increasing dopamine in a delicate balance and the way that consumption of two to three shots of light coffee per day could have a positive effect on dopamine levels for human and can control depression as well.

**Keywords:** Coffee, Dopamine Level, Caffeine, Treatment, Life Balance

## Introduction

Caffeine is regarded as an excellent beverage worldwide, due to part with its wide selection of bioactive compounds like chlorogenic acids, diterpenes, and alkaloids [1]. It was found that regular coffee consumption appears negatively linked to neurodegenerative disorders like Parkinson's disease (PD) and Alzheimer's disease (AD) when the extent of this disease was being studied using epidemiologic studies [2]-[4]. Two key attributes of Parkinson's Disease [PD] are the presence of the  $\alpha$ -synuclein rests (aka Lewis bodies) and the loss of dopaminergic neurons from the substantia nigra part compacta [5][6].

The fundamental features of AD are the accumulation of neurofibril negligences and amyloid-beta peptide (also known as neuropathologic plaques) which are the causes of the progression of cognitive functions caused by the death of Cholinergic neurons in the neocortex, limbic system, and the various regions of other brain [7][8].

The mechanism by which vitamin E reacts with oxidative stress may help to slow the development or progression of AD and PD. Oxidative stress and the accumulation of reactive oxygen species are considered significant factors that have close relationships with both of these disorders [9]. The primary reason for coffee's neuroprotective reputation is the caffeine encompassing these receptors competently. For example, it is known that basal ganglia in specific locations, particularly the part that is damaging due to adenosine acting via dopaminergic receptors, has a close anatomical and functional relationship with adenosine receptors. This is why adenosine antagonists when used can be a good approach for improving PD. Besides AC inhibition, caffeine has exhibited its adenosine receptor-inhibiting effects [10][11].

Consequently, coffee phytochemicals are potential therapeutic agents for the treatment of AD since they are non-competitive inhibitors similar to AD drugs, the cholinesterase inhibitors [12], [13], [14], [15]. Notwithstanding, other neuroprotective factors are present in coffee ingredients, which are strongly linked to AD.

The current treatments for Parkinson's disease (PD) and Alzheimer's disease (AD) can prolong life, but they cannot stop the progressive degeneration of neurons. For this reason, it is crucial to find protective factors, such as lifestyle changes or diet, that may lower the chance of developing these neurodegenerative diseases, as well as medications that may stop the disease from progressing [16]-[18]. The purpose of the current study was to indicate the potential of instant coffee samples that had been subjected to varying roasting levels and investigate the effect of dopamine increase based on case studies.

## **Positive Effect of Coffee on Illnesses**

Studies on the observational levels as well as meta-analyses suggest that coffee and caffeinated beverages are good for neurological diseases like Parkinson's disease and Alzheimer's disease. The experimental data proves the role of caffeine and other coffee components as a defensive element against the biochemical responses and this has been proved through the animal models.

An examination carried out to the possible preventive/treatment capabilities of coffee extracts tried different approaches in modeling PD, including antioxidant activity, pro-dopaminergic activity, neuroprotection, as well as inhibition of the acetylcholinesterase enzyme which might potentially be relevant for cognitive functions in PD and AD.

The study was focused on mitochondrial evaluation of roasting and caffeine effects in two different in vitro antioxidant assays. The four coffee samples used in the analysis had a closer approach to the mineral profile than light roast and dark roast having caffeine in higher concentration.

Every coffee beverage that was tested for anti-oxidant characteristics exhibited the same radical scavenging capacity that could hardly be linked to caffeine content. Dark roast coffee demonstrated the highest scavenging property in the assay on biological membrane peroxidation, whereas medium roast coffee became the most important antioxidant in the evaluation of lipid peroxidation.

## **Caffeine Intake and Dopamine Increase**

Research indicates that the consumption of coffee might even prevent Alzheimer's disease (AD) or related intellectual decline by decreasing the amount of harmful amyloid venins in the brain. According to the experiments, caffeine diminishes the interaction between beta-amyloid seed and amyloid fibril, indicating that this alkaline may behave like an anti-PD and AD drug.

The main underlying mechanism through which caffeine and PD interact is supposed to be the inhibition of the adenosinergic system or, possibly, the modulation of the dopaminergic system. Caffeine is one of the necessary ingredients of a sample to produce behavioral changes, and as the two caffeinated coffee cups were able to dose-dependently prevent the cataleptic status which was induced by haloperidol, the caffeinated cup had no effect.

Medicine able to suppress or nullify haloperidol-induced catatonic status, on the other hand, is a likely therapeutic approach to motor dysfunction noted in Parkinson's disease.

## Experimental Results and Questionnaires

The highest dose of medium roast coffee was able to decrease significantly the number of rotations induced by methamphetamine, which promotes ipsilateral rotation due to greater release of dopamine and reuptake blockade in the intact side. This dose also reduced the Apomorphine-induced contralateral rotations by 70%, although it was not statistically significant.

Many other coffee components have shown neuroprotective effects in in vitro assays and experimental models of PD. Overall, these data support that regular use of coffee is beneficial for brain health, as demonstrated by experimental and observational studies.



### Experimental Tests Based on Questionnaires Performed at Dopamine Cafe

More than 60 experimental case study candidates participated in this research and with the cooperation of the Dopamine Café and the Barista, the consumption of single shots of Espresso coffee was performed for around two weeks, the results were investigated in SPSS 2023 software based on the answers of questionnaires given to the candidates in this research study.

The final results imply that those who consume above 4 shots of coffee in a day high a bit of stress during their life routine on that specific day resulting in some struggles with their family member in the same way, those with less than 2 shots of coffee intake, having almost no difference compared to the other days of their previous experience. As a result, the perfect dosage for dopamine hormone increases causing a better temper, balancing anger, balanced energy, good morality, less feeling of depression, and consuming 2-3 shots of coffee whether Espresso or other types of coffee like Latte, Americano, Mocha, etc.

## Conclusion

Nevertheless, an excellent argument is that epidemiological research indicates that coffee drinking lowers the risk of neurodegenerative illnesses, but contradictory views appeared regarding the actual dosage and degree of roast. The purpose of this research is to measure the antioxidant levels of the products as well as the degree of happiness after consumption of the caffeinated instant light-, medium-, dark-, and non-branded roast coffee samples. Caffeinated coffee samples had their antioxidant capacity indicated in all samples, suggesting that there was no connection between the caffeine concentration in coffee and antioxidant capacity. Similarly, coffee as needed had an identical effect as shown in exercising performance. When the participants in the study took methamphetamine have a direct link to increased dopamine levels in their brains, which is in accordance with the findings that were discovered in coffee consumption. Coffee in the dosage might guard dopamine level downfall not stabilized during treatment in the substantial, the neurons and condition for the life happen. Therefore, as per our findings, caffeine dosage is the main concern for these effects, and drinking 2-3 cups of light coffee over a day time could positively affect that person's dopamine level and it could be used as a depression savior at the same time.

## References

- [1] Saud S, Salamatullah AM. Relationship between the chemical composition and the biological functions of coffee. *Molecules* 2021, 26, 7634. doi: 10.3390/ molecules26247634
- [2] Socała, K.; Szopa, A.; Serefko, A.; Poleszak, E.; Wlaz, P. Neuroprotective effects of coffee bioactive compounds: a review. *Int J Mol Sci* 2021, 22, 107. <https://dx.doi.org/10.3390/ijms22010107>
- [3] Sääksjärvi K, Knekt P, Rissanen H, Laaksonen MA, Reunanen A, Männistö S. Prospective study of coffee consumption and risk of Parkinson's disease. *Eur J Clin Nutr* 2008, 62, 908-915. doi:10.1038/sj.ejcn.1602788
- [4] Hu G, Bidel S, Jousilahti P, Antikainen R, Tuomilehto J. Coffee and tea consumption and the risk of Parkinson's disease. *Mov Disord* 2007, 22, 2242-2248. doi:10.1002/mds.21706
- [5] Arendash GW, Cao C. Caffeine and coffee as therapeutics against Alzheimer's disease. *J Alzheimers Dis* 2010, Suppl 1, S117-126. doi:10.3233/JAD-2010-091249
- [6] Ross GW, Abbott RD, Petrovitch H, Morens DM, Grandinetti A, Tung KH, et al. Association of coffee and caffeine intake with the risk of Parkinson disease. *J Am Med Assoc* 2000, 283, 2674-2679. doi:10.1001/jama.283.20.2674

- [7] Islam MT. Oxidative stress and mitochondrial dysfunction-linked neurodegenerative disorders. *Neurol Res* 2017, 39, 73-82. doi: 10.1080/01616412.2016.1251711
- [8] Hampel H, Mesulam MM, Cuello AC, Farlow MR, Giacobini E, Grossberg GT, et al. The cholinergic system in the pathophysiology and treatment of Alzheimer's disease. *Brain* 2018, 141, 1917-1933. doi:10.1093/brain/awy132
- [9] Roman, G. C., Jackson, R. E., Gadhia, R., Román, A. N., & Reis, J. (2019). Mediterranean diet: The role of long-chain  $\omega$ -3 fatty acids in fish; polyphenols in fruits, vegetables, cereals, coffee, tea, cacao and wine; probiotics and vitamins in prevention of stroke, age-related cognitive decline, and Alzheimer disease. *Revue neurologique*, 175(10), 724-741.
- [10] Sharma, V. K., Sharma, A., Verma, K. K., Gaur, P. K., Kaushik, R., & Abdali, B. (2023). A Comprehensive Review on Pharmacological Potentials of Caffeine. *Journal of Applied Pharmaceutical Sciences and Research*, 6(3), 16-26.
- [11] Merighi, S., Travagli, A., Nigro, M., Pasquini, S., Cappello, M., Contri, C., ... & Gessi, S. (2023). Caffeine for prevention of Alzheimer's disease: Is the A2A adenosine receptor its target?. *Biomolecules*, 13(6), 967.
- [12] Howes, M. J. R., Perry, N. S., Vázquez-Londoño, C., & Perry, E. K. (2020). Role of phytochemicals as nutraceuticals for cognitive functions affected in ageing. *British journal of pharmacology*, 177(6), 1294-1315.
- [13] Socała, K., Szopa, A., Serefko, A., Poleszak, E., & Wlaź, P. (2020). Neuroprotective effects of coffee bioactive compounds: a review. *International journal of molecular sciences*, 22(1), 107.
- [14] Hartman, R. E., & Ross, D. M. (2018). Effects and mechanisms of actions of phytochemicals on Alzheimer's disease neuropathology. *neuropathology*, 4, 19.
- [15] Wang, Y., Lim, Y. Y., He, Z., Wong, W. T., & Lai, W. F. (2022). Dietary phytochemicals that influence gut microbiota: Roles and actions as anti-Alzheimer agents. *Critical reviews in food science and nutrition*, 62(19), 5140-5166.
- [16] Herden, L., & Weissert, R. (2018). The impact of coffee and caffeine on multiple sclerosis compared to other neurodegenerative diseases. *Frontiers in nutrition*, 5, 133.
- [17] Colombo, R., & Papetti, A. (2020). An outlook on the role of decaffeinated coffee in neurodegenerative diseases. *Critical Reviews in Food Science and Nutrition*, 60(5), 760-779.
- [18] Ruggiero, M., Calvello, R., Porro, C., Messina, G., Cianciulli, A., & Panaro, M. A. (2022). Neurodegenerative diseases: Can caffeine be a powerful ally to weaken neuroinflammation?. *International Journal of Molecular Sciences*, 23(21), 12958.