

## Dopamine: A Chemical Leader of Brain

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### INTRODUCTION

Dopamine (3, 4-dihydroxyphenylthylamine) is an organic chemical of the catecholamine and phenethylamine families. It is a neurotransmitter synthesized in both central nervous system and periphery, that exerts its actions upon binding to G protein-coupled receptors. The dopaminergic system plays important roles in neuromodulation such as motor control, motivation, cognitive function, maternal and reproductive behaviours. Unbalanced activity of dopamine may lead to neurodegenerative diseases like Parkinson's disease, depression, unmotivated feeling, loss of reward activity etc. High level of dopamine causes Attention Deficit Hyperactive Disorder (ADHD), schizophrenia, food addiction, drug addiction. (Klien et al., 2019)

Dopamine genetic risk and its relation to food addiction and body mass through reduced reward-related ventral striatum activity was studied by Romer et al. (2019). Results revealed that polygenic dopamine scores were related to ventral striatum activity, which was associated with higher food addiction scores. In addition to that food addiction was related to BMI. An exploratory post-hoc path analysis further indicated that polygenic scores were indirectly related to both food addiction and BMI, through ventral striatum activity.

McGuigan et al. (2019) conducted a study to know how dopamine modulates the willingness of patients with Parkinson's disease to invest cognitive effort in return for reward. Study included 20 patients with Parkinson's disease (on and off medication) and 20 healthy controls. The result revealed that patients with OFF medication were significantly less cognitively motivated than control followed by ON medication patients. Thus it was concluded that dopamine therapy will help in improving the motor symptoms and physical motivation in patients with Parkinson disease, and also to improve their willingness to engage in cognitively demanding behaviour.

Striatal dopamine regulation on systemic glucose metabolism in humans was investigated by Ter et al. (2018). The study consisted of diabetic, nondiabetic with OCD (Obsessive compulsive disorder) patient and healthy individuals. Results revealed that diabetes patients displayed strongly reduced insulin requirements after treatment with bilateral deep brain stimulation (DBS) targeting the anterior limb of the internal capsule. In nondiabetic patients with obsessive-compulsive disorder increased hepatic and peripheral insulin sensitivity was observed and in healthy subjects systemic dopamine depletion reduced the peripheral insulin sensitivity.

Frank et al. (2016) investigated the influence of dopamine depletion on food-reward processing using an acute phenylalanine/ tyrosine depletion drink (DOPD) and balanced amino acid drink (CON). Dopamine depletion resulted in reduced activation in the striatum and the brain activity was more in CON than in DOPD. Brain activity during the wanting task activated a more distributed network than during the liking task.

Investigation of relationship between food addiction (Food Craving Inventory and Power of Food Scale), body composition measurement, and a dopamine-resistant receptor polymorphism (DRD2 A1) through genotyping was done by Yeh et al. (2016). Significant differences were noted in food cravings of carbohydrates and fast food on the Food Craving Inventory between the A1 and A2 allele groups. Further among females, there was a difference on the Power of Food questionnaire which was not seen among men. The study concluded that greater carbohydrate and fast food craving was associated with the DRD2 A1 versus A2 allele among Asian Americans.

### CONCLUSION

Dopamine as a neurotransmitter, has its physiological function in every potential

action like food cravings, food reward, cognitive movement, motivation, memory, behaviour, depression etc, either inhibitory or excitability actions. Increased or decreased level of dopamine in brain is associated with many disorders like Parkinson disease, depression, eating behaviour, ADHD, food addiction. Through dopamine agonist drugs and life style changes like exercise, meditation, social activeness, protein rich foods, tyrosine rich foods helps to maintain the normal dopamine level. Fried foods, junk foods, high sugar, caffeine, drugs, tobacco disturbs the dopamine level in the brain and affects the physiological and behavioural condition.

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