

Dementia and Alzheimer's Disease

September 16-17, 2019 | Paris, France

The influence of caffeine and nicotine co-administration in enhancing the power of physical activity against aluminum-induced Alzheimer's disease in rats

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Background: Alzheimer's disease (AD) is a neurodegenerative disorder characterized clinically by impairment of cognitive ability and memory. It represents one of the most financially draining and health problem diseases worldwide. Co-administration of caffeine and nicotine can attenuate the impairment of memory and cognitive decline associated with AD. Physical activities promote neurogenesis, decrease inflammatory reaction and eliminate oxidative stress.

Objective: The aim of the study is to evaluate the influence of physical activity together with caffeine and nicotine co-administration against aluminum-induced neurotoxicity that mimics AD in rats, in addition to study their possible mechanistic neuroprotective pathway.

Methods: Eight groups of rats were used and received daily for four weeks: Saline for control, one group served as model for AD and received (70 mg/kg, IP) aluminum chloride.6H₂O (AlCl₃). The other six treated groups (three of AD model and three without AlCl₃) received combination of caffeine (2.5mg/kg, IP) and nicotine (0.5 mg/kg, SC) or exposed to physical activity (5 min swimming) or both of them. Three behavioral experiments were performed: Forced Swimming (FS) test, Morris Water Maze (MWM) task and Conditioned-Avoidance and Learning (CAL) test. Histopathological changes in the brain as well as biochemical changes in acetyl cholinesterase (AChE), β -amyloid protein (A β), oxidative stress markers (TAC, SOD, MDA), monoamines (NE, DA, 5-HT), inflammatory mediators (IL-6, TNF- α , NF- κ B), brain derived neurotrophic factor (BDNF), insulin-like growth factor-1 (IGF-1), glycogen synthase kinase-3 beta (GSK-3 β), β -catenin and Caspase-3 were also evaluated for all groups.

Results: Behavioral tests showed that co-administration of caffeine and nicotine together with physical activity have more pronounced protecting effect from learning and memory impairment induced by AlCl₃ than physical

activity alone. They also prevent neuronal degeneration in the hippocampus induced by AlCl₃ while physical activity alone or co-administration of caffeine and nicotine still showed mild degeneration in hippocampus. The marked protection of both physical activity and co-administration of caffeine and nicotine is confirmed also by the significant improvement in biochemical parameters in brain tissue than using each of them alone.

Conclusion: Physical activity together with co-administration of caffeine and nicotine can reduce the risk of neuronal degeneration in the hippocampus and attenuate the impairment of learning and memory associated with AD in rats.

Speaker Biography

Azza A Ali has completed her PhD specialized in Pharmacology and Toxicology from Faculty of Pharmacy, Cairo University, Egypt. She developed research line of behavioral pharmacology in Egypt and participated as Advisory Board Member of the Arab Association for Pharmacy Development and its conference (AIPC 2019). She is member of many scientific societies as (AAPS) and Alzheimer's Association (ISTAART). She is also an Editorial Board Member of many international Journals as Brain Disorder & Therapy, Acta Psychopathologica, EC Pharmacology and Toxicology as well as Organizing Committee Member and Chairperson at many international Conferences as the International Conference on Brain Disorders & Dementia Care, Canada (2017) and International Conference on Parkinson's Disease & Movement Disorders, USA (2017, 2018). She published more than 60 papers in reputed journals, supervised and discussed more than 90 PhD and MSc thesis and actively participated by workshop, oral and posters presentations at many international conferences especially on Dementia and Parkinson's disease and in the Alzheimer's Association International Conference (AAIC 2016, 2017). She has many appreciation certificates and certificate of best presentation award at 19th International Conference on Environmental Pollution and Pollution Control, London, UK (ICEPPC 2017). Now she is a Head of Pharmacology and Toxicology Department and Member of the Committee for the Promotion of Professors at Al-Azhar University, Egypt.

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