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Protection against development of parkinsonism in rats: Impact of nutrients versus the deleterious effects of manganese

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Background: Parkinson's disease (PD) is a degenerative progressive disorder in which symptoms occur after 80 percent of dopamine is lost. It mainly affects substantia nigra which responsible for relaying messages to plan and control body movement. Excessive exposure to manganese (Mn) is strongly associated with an extrapyramidal motor disorder similar to PD. Cocoa represents one of the most nutritious foods in the world. It reduces stress, depression and promotes better memory as well as concentration. Pomegranate (POM), Wheatgrass (WG) and Coenzyme Q10 (CoQ10) are powerful antioxidants but POM has also powerful anti-inflammatory and antiapoptotic activity. All of these nutrients exert neuroprotective effects; they can improve memory as well as cognitive and behavioral deficits.

Objective: To evaluate and compare the potential protective effect of Cocoa, POM, WG, CoQ10 and their combinations against PD induced by Mn in rats.

Methods: Six groups of rats were used: one received saline while five received MnCl₂ (10mg/kg IP) daily for 4 weeks either alone or in combination with one of the following: Cocoa (24mg/kg PO), POM (150mg/kg PO), CoQ10 (200mg/kg PO), WG (100mg/kg, PO) or their combinations. All rats were subjected to five behavioral tests; Grid, Bar, Swimming, Open-field, and Y-maze. Biochemical changes in monoamines as well as in AChE, BDNF, GSK-3, Glutamate, GABA, INOS, Cox2 and in oxidative markers besides excitotoxicity, apoptotic and neuroinflammatory markers were evaluated together with histopathological examinations.

Results: Mn increased catalepsy while decreased neuromuscular co-ordination together with locomotor, emotionality and exploratory activity. It also impaired vigilance, spatial memory, and decision making. Most behavioral impairments induced by Mn had been improved using Cocoa, POM, WG or CoQ10, especially with POM and Cocoa. Combination of Cocoa, POM, WG, and CoQ10 showed more pronounced improvements which confirmed by biochemical as well as histopathological examinations in all brain regions.

Conclusion: Cocoa or POM showed more pronounced protection against neuronal degeneration and behavioral impairments induced by Mn than WG or CoQ10. However, nutrients combination showed maximum protection as compared to each of them alone against PD induced by Mn in rats.

Biography

Azza A Ali has completed her PhD specialized in Pharmacology and Toxicology from Faculty of Pharmacy, Cairo University, Egypt. Her postdoctoral studies included different scientific aspects especially on neurodegenerative disorders; she also developed research line of behavioral pharmacology in Egypt. She is member of many scientific societies as (AAPS) and Alzheimer's Association (ISTAART). She is also 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 Parkinsons Disease & Movement Disorders, USA (2017). She published more than 60 papers in reputed journals, supervised and discussed more than 90 PhD and MSc thesis and actively participated by oral and posters presentations at many international conferences especially on Alzheimer's disease and Dementia as well as on Parkinsons disease as Dementia Conferences (2015, 2016), Alzheimer's Association International Conference (AAIC 2016, 2017) and Parkinsons Conference (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 at Al-Azhar University, Egypt.

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