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Exploring the kaleidoscopic oasis of epigenetics-based diet, brain games and physical exercises in cognitive aging and Alzheimer dementia: Evidence, promises and challenges

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Background: Recently, increased interest has been expressed in developing diverse strategies to optimize cognitive aging and to modify the onset and course of Alzheimer's dementia (AD). The interaction of Gene and Environment in modulating cognitive decline is best understood within the framework of Epigenetics. Epigenetics refers to heritable changes in gene expression and remodeling of chromatin and dependent of alterations in DNA sequence, and comprise of three key components; DNA methylation, histone modifications (acetylation and deacetylation) and non-coding microRNA. Epigenetics targets play major role in reprogramming of neural networks and neural repair. Epigenetics can turn genes "On" and "Off" depending upon the milieu. There is emerging evidence supports the model of dysregulation in epigenomics in age-related cognitive decline and AD. A large number of studies have shown that nutrition factors: diets, dietary and herbal supplements, functional foods, are capable of regulating the epigenetic states and targets in reversing abnormal gene activation or silencing. Physical exercises and e-delivered brain games likewise can change various domains in aging and in AD through the epigenetics signatures. We review the translational and clinical evidence in support of the beneficial effects of dietary phytochemicals from diverse dietary sources; grapes, chocolates, green and black coffee, soya beans and fava beans, curry extract, peanuts, garlic and ginger and seafood products have positive impact on epigenomics in facilitating translational and transcriptional events involved in memory, attention and executive functions. The findings from the studies on DASH and Mediterranean diets reinforce the relevance of epigenetic diet menu, along with the proposed Epigenetics diet for cognitive aging platform. We will also discuss the multi-faceted actions of herbal supplements: Panax Ginseng and Curcumin from Curry extract, and Zembrin extract from South African plant *Sceletium tortuosum*. and diet menu

in enhancing vascularneuronal coupling and to reduce metabolic and vascular risks in aging. Epigenetics targets are also sensitive to environmental stimuli and processing. Hence physical exercises and e-delivered cognitive challenge tasks like puzzles, video games. The evidence is mounting in terms of the putative positive effects in reprogramming neural circuitry for cognition and reactivating neurogenesis in the hippocampus. We conclude that epigenomics-driven lifestyle measures and diet interventionsare promising in cognitive aging on the progression of AD. We anticipate in the near future we will have epigenetics-based dietary and exercise and e-stimulation can prevent AD and optimize cognitive aging and will be translated intoevidence-based practice guidelines forgeriatric care. We believe that biotechnology caneventuallytransform bioactive factors to CNS drug candidates for AD treatment and prevention.

Objectives: At conclusion of this session, the participant should be able to understand how cognition can be regulated through dietary interventions targeting Epigenomics in aging & Alzheimer dementia (AD). To evaluate the benefit-to-risk ratio and evidence of clinical cognitive studies of specialized diets, dietary supplements and functional foods in preventing cognitive decline in aging and in AD. To gain insights into the benefits of aerobic exercise and e-delivered video games in reprogramming gene expression and neural circuits involved in cognitive aging and in modifying the course of AD. To identify fiscal and systemic issues involved in translating new research findings on brain foods, exercise and e-delivered brain exercise to evidence-based practice in geriatric are to understand how epigenomics may shed light on the link of nutrition, cognition and AD and has the potential to transform bioactive phytochemicals to promising drugs for treating and preventing AD.

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