

19TH ASIA PACIFIC DIABETES CONFERENCE

July 20-22, 2017 Melbourne, Australia



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The interaction of diabetes mellitus and ageing on higher brain functions: Is diabetes mellitus an accelerated form of ageing?

The aim of the present study was to examine learning and hippocampal synaptic plasticity in ageing and diabetes, based on the hypothesis that the effects of diabetes and ageing on the brain could interact. This hypothesis stems from clinical observations that the effects of diabetes on the brain are most pronounced in the elderly. Moreover, many of the processes which have been implicated in the pathogenesis of brain ageing, in particular oxidative stress, microvascular dysfunction, non-enzymatic protein glycation and disturbed intracellular calcium homeostasis are also implicated in the development of diabetic complications. To find the possible interaction between diabetes and ageing, we investigated Morris water maze performance and examined hippocampal synaptic plasticity *ex vivo* in young adult and aged diabetic and non-diabetic rats. Because the study aimed to examine the additive effects of diabetes and ageing on the brain, an experimental protocol was chosen in which each of these two conditions in isolation produces only moderate deficits. Rats were examined after 2 months of diabetes, which produces half-maximum deficits in synaptic plasticity in young adult rats. Aged rats were examined at 2 years of age, when they have developed moderate changes in synaptic plasticity due to ageing alone. Significant learning impairments were observed in young adult diabetic rats compared with controls. These impairments were even greater in aged diabetic animals. In hippocampal slices from young adult diabetic animals long-term potentiation was impaired compared with controls. In contrast, induced long-term depression was enhanced in slices from diabetic rats compared with controls. It is concluded that both diabetes and ageing affect learning and hippocampal synaptic plasticity. The cumulative deficits in learning and synaptic plasticity in aged diabetic rats indicate that the effects of diabetes and ageing on the brain could interact.

Biography

Amer Kamal Al Ansari is the Head of the Department of Physiology in Arabian Gulf University since 5 year and is been in teaching profession since 30 years in medical colleges. Presently, he is the Professor and Researcher in Utrecht University and Rudolf Magnus Institute for Neurosciences, Netherlands and is a leading author of more than 50 articles on electrophysiology of DM (and others) in international journals.

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