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Hippocampal synaptic plasticity and the role of psychostimulants on the higher brain cognitive functions and behavior in Streptozotocin-induced DM in rats

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The aim of this study was to investigate the effect of caffeine consumption in learning and memory in Streptozotocin (STZ, 60 mg/kg i.p) -induced DM in mice. First the NMDA (N-methyl-D-aspartate) component of the field excitatory post synaptic potential (fEPSP) was determined by extracellular recording from hippocampal slices prepared from STZ-induced DM and control animals. Later, 40 animals were randomly divided into 5 groups (n=8 in each group): (1) Normal control, (2) Diabetic group (DM), (3) Diabetic pretreated with caffeine group, (4) Diabetic acute caffeine treated group and (5) Diabetic chronic caffeine treatment group. Learning and memory were assessed by Morris-water maze. The latency to reach the platform reflects the learning and memory of the tested animals. Recording from hippocampal slices showed a significant reduction in the NMDA-component of the fEPSP responses compared to the control. The behavior study shows that all the DM-groups demonstrated shows defects in learning and memory tasks and only acutely administered caffeine (Ac Caf) could reverse the deteriorating effect of DM on the learning and memory functions. Animals of this group showed lower latency values (72.4±8.6 s) to reach the hidden platform in the water maze compared to the other diabetic groups (DM=116.67±3.33, Pre Caf=101.8±7.1 and Ch Caf=94.13±7.8) (ANOVA, $p<0.05$). The performance of this group was not significantly different than the control animals. We concluded that the NAMD-receptor component of the fEPSP was significantly reduced in the STZ-induced DM. This resulted in deterioration in memory tasks. Acute administration of caffeine could reverse this defect. Pre-treatment of the mice with caffeine before the induction of DM may partially protect these animals from the cognitive-induced defects by the induced DM.

Biography

Amer Kamal Al Ansari is the Head of the Department of Physiology in Arabian Gulf University since 5year 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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