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Modelling Hippocampal Degeneration in Rats: Which Toxicant Is "Better"?

Introduction: Despite extensive research on Alzheimer's Dementia (AD), a proper treatment for this disease is still largely undetermined. Thus, an effective, simple, cheap, and minimally invasive animal model for hippocampal-related AD is highly needed. This study compares the influence of trimethyltin (TMT), scopolamine, and D-galactose-AlCl3 (DgalAl) on the rat's hippocampus spatial memory, pyramidal cell quantity, and oxidative stress status. Methods: Male Wistar rats were divided into 4 groups: one control group and three treatment groups. They were treated with a specific dose of TMT, scopolamine, and a combination of D-galactose and AlCl3 at different durations. Then, the Morris water maze was employed to examine the rat's spatial memory. Unbiased stereological procedures were applied to project the number of hippocampal pyramidal cells. Finally, hippocampal antioxidant enzyme (Cu-ZnSOD, GPx, and catalase) levels were measured using ELISA procedures. Results: During the escape acquisition phase, the TMT group declined spatial learning in most trials. The same finding occurred in several trials of the scopolamine group but not in the DgalAl group. Deterioration of the memory retention also occurred in TMT probe trials, but not in the other two treatment groups. This research also reported the number of pyramidal cells in the CA1 region. It revealed a significantly lower number than in the other groups. No significant difference was observed across groups in pyramidal cells of the CA2-CA3 region. Besides, the levels of antioxidant enzymes in the rat's hippocampus also did not record any significant difference. Conclusions: TMT induced hippocampal-degeneration more than scopolamine and D-galactose-AlCl3.
Key-words: Alzheimer's disease, spatial memory, stereology, pyramidal cells, antioxidant enzymes

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