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Passive avoidance learning induces homer 1a expression in the hippocampus

Immediate early genes (IEG) are subdivided into regulatory IEGs and effector IEGs. Both regulatory and effector IEGs have been found to be overexpressed following various learning tasks and are critical components of long-term memory formation in the hippocampus. Effector IEGs encode a variety of proteins including growth factors, structural proteins, and signal transduction proteins such as homer 1a. Regulation of homer 1a mRNA expression in hippocampal CA1 neurons has been found during exploration of a new environment. The goal of this project is to see if the hippocampal expression of homer 1a is upregulated in response to a specific type of associative learning. Three groups of animals were used: “shocked”, “context exposure alone, no shock” and “trained” in a step-down passive avoidance task. Animals in the “shocked” and “context, no shock” groups stepped down from the platform very fast while the “trained” animals stayed for a significantly longer time. In situ hybridization revealed an increase in homer 1a mRNA expression in CA1 of the trained animals compared to the other two groups. No changes were detected in any other hippocampal subregions. From this experiment, the selective expression of homer 1a in CA1 neurons during memory formation suggests that homer 1a may contribute to the modification of synaptic networks of the hippocampus along with the integration of memory processing in associative learning.