Hippocampal calcineurin activity levels are altered during the formation and modification of memory

Havekes R, Luiten PGM, Van der Zee EA
Dept of Molecular Neurobiology, University of Groningen, Groningen

Our knowledge about the role of phosphatases in hippocampal-dependent learning is limited. Here, we examined the impact of various stages of spatial learning in a Y-maze on the activity of hippocampal calcineurin (a calcium dependent protein phosphatase). Calcineurin activity was examined in the hippocampus of mice trained in a Y-maze as compared to home cage controls. Mice were assigned to one of the following groups: home cage controls (HCC), aquisition training (AT), trained (T), extinction training (ET). All except the HCC were habituated to the Y-maze.
Animals of the AT, T & ET group were trained with a food reward in the right arm. After the initial training, the ET group was allowed to enter the maze, but now without food in either of the two accessible arms (i.e. extinction training). Following these Y-maze tests the brains were quickly removed. The hippocampus was dissected and calcineurin activity was measured in both the cytosol and membrane fraction separately (using a non-radioactive ELISA kit).
Hippocampal calcineurin activity was significantly decreased in the AT and T group compared to the HHC. However, the calcineurin activity levels were restored to baseline levels in the hippocampus of the ET group due to the extinction training. Secondly, in the membrane fraction containing approximately 25% of the activity found in the cytosol, calcineurin activity was significantly increased in the ET group compared to the HCC, AT and T group. Taken together, these results suggest that calcineurin plays a specific role in both the formation and modification of memory in the hippocampus with differential regulation of cytosol and membrane calcineurin activity.

Robbert Havekes, Department of Molecular Neurobiology, University of Groningen, Postbus 14, 9750 AA Haren, t 050 3632363, e-mail r.havekes@biol.rug.nl

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