

Astaxanthin supplementation enhances adult hippocampal neurogenesis and spatial memory in mice

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Scope: There is a growing necessity for efficacious natural supplements with antioxidant effects on the brain, in particular, hippocampal function. One such compound, which also has a neuroprotective effect, is the carotenoid astaxanthin (ASX). Despite ASX's potential benefit to the brain, very little is known about its effect on hippocampal plasticity and cognition. Thus, we investigated the effect of ASX on adult hippocampal neurogenesis (AHN) and spatial memory using a mouse model.

Methods and results: Dose-response was examined in mice fed ASX-supplemented diets (0, 0.02, 0.1, and 0.5%) to define the effect of ASX on AHN. In conjunction with AHN results, hippocampus-dependent cognitive function was assessed. We delineated molecular mechanisms associated with ASX-enhanced AHN using DNA microarray analysis. Results revealed that ASX enhanced cell proliferation and survival at 0.1% and 0.5% doses. Newborn mature neurons were higher only with 0.5% ASX, which also enhanced spatial memory. Transcriptomic profiling revealed potential AHN-associated molecules (*Prl*, *Itga4*, and *Il4*) that were ASX induced. Their downstream factors, identified through Ingenuity Pathway Analysis, were positively correlated with ASX-induced increases in spatial memory.

Conclusion: ASX supplementation enhanced AHN and spatial memory, and a DNA microarray approach provided, for the first time, novel molecular insights into ASX action.

Keywords:

Adult hippocampal neurogenesis / Astaxanthin / DNA microarray / Spatial memory / Transcriptomic profile



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