The role of heart-type fatty acid binding protein (H-FABP/FABP3) in the brain function

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Heart-type fatty acid binding protein (H-FABP) belongs to a family of intercellular lipid-binding proteins. H-FABP exhibits a binding affinity to long-chain fatty acids whose effects on brain functions including emotion, learning and memory have been proposed. In the present study, we examined behavioral and molecular biological phenotype of H-FABP gene-ablated mice. In immunohistochemical studies on adult mouse brain, H-FABP was highly expressed in neurons in the cinguate cortex, field CA1 and CA2 of hippocampus, subiculum and molecular layer of cerebellum. In H-FABP gene-ablated mice, there were no marked microscopic abnormalities in the brain. Behavioral analyses revealed that H-FABP gene-ablated mice showed reduced exploratory activity, increased anxiety and prolonged fear response as revealed by the open field test , the elevated plus maze, and the passive avoidance test, respectively. Furthermore, the significant decrease of phosphorylation of cyclic AMP-responsive element binding protein (CREB), calcium/ calmodulin-dependent protein kinase IV (CaMKVI) and CaMKII was detected in the cingulated cortex of H-FABP gene-ablated mice, where the expression of brain-derived neurotrophic factor (BDNF), a target of CREB, was also decreased. These data indicate that H-FABP is crucially involved in the fear memory and anxiety through regulating neuroplasticity in the cingulate cortex.