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Organization of WAVE-1 in hippocampal dendritic spines

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Recent in vitro studies have shown that theWAVE (Wiskott–Aldrich syndrome Verprolin-homology) family of actin binding proteins play an important role in modulating synaptic plasticity. Moreover, dysregulation of WAVEs has been implicated in a syndromic form of mental retardation in humans, reproduced in WAVE-1 knockout (KO) mice. Loss of WAVE-1 leads to abnormalities in synaptic plasticity and deficits in memory retention, suggesting that WAVE-1 plays a key role in spine functions associated with synaptic plasticity. Here we studied EM sections from WT and WAVE-1 KO mice. Spine dimensions did not differ significantly between WT and KO, but we found significantly more trafficking endosomes in spines from KO mice than in WT controls. We also studied the organization of WAVE-1 in hippocampus. LM immunostaining revealed WAVE-1 in dendrites of pyramidal neurons; high-resolution EM labeling techniques showed that WAVE-1 extended into dendritic spines. Quantitative analysis of the gold label confirmed a close association of WAVE-1 with the spine plasma membrane. Density was especially high in the so-called “endocytic zone.” We hypothesize that WAVE-1 plays a pivotal role in the organization of the actin cytoskeleton necessary for intraspinoplasmic vesicle trafficking.