PSD95 regulates morphological development of adult-born granule neurons in the mouse hippocampus

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In the adult hippocampus new neurons are generated in the dentate gyrus from neural progenitor cells. Adult-born neurons integrate into the hippocampal circuitry and contribute to hippocampal function. PSD95 is a major postsynaptic scaffold protein that is crucial for morphological maturation and synaptic development of hippocampal neurons. Here we study the function of PSD95 in adult hippocampal neurogenesis by downregulating PSD95 expression in newborn cells using retroviral-mediated RNA interference. Retroviruses coding for a control shRNA or an shRNA targeting PSD95 (shPSD95)were stereotaxically injected into the dorsal dentate gyrus of 2-month-old C57BL/6 mice. PSD95 knockdown did not affect neuronal differentiation of newborn cells into neurons, or migration of newborn neurons into the granule cell layer. Morphological analysis revealed that newborn neurons expressing shPSD95 showed increased dendritic length and increased number of high-order dendrites. Concomitantly, dendrites from shPSD95-expressing newborn granule neurons showed a reduction in the density of dendritic spines. These results suggest that PSD95 is required for proper dendritic and spine maturation of adult-born neurons, but not for early stages of neurogenesis in the hippocampus.

Adult

Hippocampus

Neurogenesis

PSD95

disks large homolog 4

short hairpin RNA

disks large homolog 4

Dlg4 protein, mouse

adult

animal cell

Article

cell migration

controlled study

dendritic spine

dorsal dentate gyrus

down regulation

female

gene knockdown

gene targeting

granule cell

hippocampus

in vivo study

male

mouse

nerve cell differentiation

nervous system development

newborn

nonhuman

priority journal

protein expression

protein function

RNA interference

adult stem cell

animal

C57BL mouse

cell differentiation

cell motion

cytology

hippocampus

metabolism

nerve cell

neural stem cell

physiology

Adult Stem Cells

Animals

Cell Differentiation

Cell Movement

Disks Large Homolog 4 Protein

Hippocampus

Mice

Mice, Inbred C57BL

Neural Stem Cells

Neurogenesis

Neurons