Title
Newly generated dentate granule cells from epileptic rats exhibit elongated hilar basal dendrites

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NEWLY GENERATED DENTATE GRANULE CELLS FROM EPILEPTIC RATS EXHIBIT ELONGATED HILAR BASAL DENDRITES

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Rationale: Previous studies have shown that neurogenesis occurs in the dentate gyrus of the adult and recent evidence suggests that these newly generated granule cells integrate into pre-existing hippocampal circuitry. Newly born neurons in the developing dentate gyrus have been shown to exhibit a transient basal dendrite. In adult pilocarpine-induced epileptic rats, basal dendrites are ectopically located in the hilus where they receive synaptic input from mossy fiber axons. For this study our goals were to confirm that basal dendrites are found on newly born neurons in the adult control rat, and, to determine whether the basal dendrites of newly born neurons from epileptic rats were longer than those in the control.

Methods: Using an immunocytochemical method for doublecortin which labels newly born neurons, we examined newly generated granule cells and their dendritic processes in light microscopic preperations. The lengths of the basal dendrites were measured using a grid reticule overlay method. Student's t-test was used to compare the data on length.

Results: Newborn granule cells in control and pilocarpine treated rats showed basal dendrites with extended growth cones at the border of the subgranular zone and granule cell layer. Doublecortin (DCX)-labeled cells were typically found in the subgranular zone, at the border between the subgranular zone and the granule cell layer, or in the granule cell layer. Morphological analysis of the DCX-labeled cells with basal dendrites revealed that they have a distinctly different appearance in the epileptic animals compared to the controls. Quantitative analysis showed that in the pilocarpine animals ($X = 16\ \mu m$), the basal dendrites from newly born granule cells are significantly longer than those found in the control rats ($X = 6\ \mu m$) ($P < .01$). We also demonstrate that the percentage of cells with a basal dendrite that enters the granule cell layer at an angle of 30 degrees or more is greater in the pilocarpine-induced epileptic rats.

Conclusions: The data show that newly born neurons from epileptic rats have elongated basal dendrites that invade the hilus. It is unclear what mechanisms cause this neuroplastic change for these dendrites. We speculate that the formation of hilar basal dendrites might relate to ei-ther the sprouting mossy fiber phenomenon, or hilar neuronal loss with associated gliosis both of which occur in pilocarpine-induced epilep-tic rats. (Supported by NIH grants R01-NS38331 and training grant T32-NS045540.)