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FUNCTIONAL INTEGRATION OF ADULT-GENERATED GRANULE CELLS INTO HIPPOCAMPAL MEMORY

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Throughout adulthood new neurons are continuously added to the dentate gyrus, a hippocampal sub-region that plays a critical role in learning. Our recent studies have used immunohistochemical approaches to visualize the recruitment of these new neurons into circuits supporting water maze memories in intact animals. We showed that functional integration of these adult-generated granule cells into memory circuits proceeds in a maturation-dependent manner, with new granule cells not contributing in significant numbers until they are 4 weeks or older in age. Our current studies are designed to define the range of conditions under which adult-generated granule cells contribute to hippocampal memory formation and focus, in particular, on three issues. First, the hippocampus is involved in multiple forms of spatial and non-spatial memory: Does integration depend upon the type of memory being formed? Second, levels of adult neurogenesis decline exponentially with age and are regulated by a large number of genetic and environmental factors: Does the availability of new neurons affect their rate of incorporation? Third, the dentate gyrus is composed of neurons generated embyonically and postnatally, as well as those throughout adulthood: Are developmentally- and adult-generated neurons incorporated into memory networks at the same or different rates?

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