

Adult neurogenesis in the brain of shore crabs

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Introduction:

Adult neurogenesis has been observed in the brain of several species of decapod crustaceans, such as spiny lobster (*Panulirus argus*), shore crab (*Carcinus maenas*), and crayfish (*Procambarus clarkii*). The neurogenesis observed in these decapods is seen in two distinct regions of the central olfactory pathway: the olfactory lobe of the deutocerebrum and the hemiellipsoid body of the protocerebrum. Interestingly, while neurogenesis in the deutocerebrum is maintained by neural stem cells (adult neuroblasts) associated with distinct stem cell niches, neurogenesis in the protocerebrum is maintained by adult neuroblasts that are not accompanied by such niches. Aside from this key difference, the neurogenic areas (proliferation zones) in the deuto- and protocerebrum have a similar organization. Through double-labeling with the proliferation marker 5-bromo-2'-deoxyuridine (BrdU) and antibodies against neuropeptides it has been demonstrated that the cells born in the proliferation zones in the deutocerebrum of *P. argus* and *P. clarkii* mature into neurons within months. Aim of this study is to determine if newly generated cells mature into neurons also in adult shore crabs, with a focus on adult neurogenesis in the hemiellipsoid body where such demonstration is entirely lacking.

Methods:

We injected adult *C. maenas* with BrdU and after a survival time of 2 months fixed their brains and performed double labeling with neuropeptide antibodies that we had selected through a previous screen for labeling the olfactory lobe and the hemiellipsoid body. Sections were examined using fluorescent microscopy in an attempt to identify cells double labeled with the neuropeptide antibody and BrdU.

Results:

Analysis of brain sections labeled with anti-BrdU and anti-SIFamide, the antibody that most distinctly labeled both neuropils, did not reveal any double labeled cells in the vicinity of the respective proliferation zones. However, in the deutocerebrum we found BrdU-positive cells being interspersed with SIFamide-positive cells suggesting that the newly generated cells (BrdU-positive) moved to locations typical for mature neurons.

Discussion:

Using other antibodies against neuropeptides and neurotransmitters (e.g. anti-GABA, anti-glutamate) for double-labeling with anti-BrdU will be the focus of future investigations. Demonstrating neuronal maturation in the hemiellipsoid bodies of decapods is particularly interesting, because the likely homologous neuropils in the insect brain, the mushroom bodies, also have adult neurogenesis.