Spatiotemporal distribution of a novel doublecortin-like (DCL) protein during early mouse development: a novel neuroblast marker?

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Brain development requires the well-coordinated spatiotemporal expression of various genes. *Doublecortin* (DCX) is a recently discovered microtubule-associated phospho-protein (MAP), widely expressed in migrating neuroblasts and differentiating neurons. It is widely expressed during neocortex development when massive neuronal migration occurs, that is guided by radial glial.

Recently, we have cloned a novel cDNA encoding a DCX-like (DCL) protein with 73% amino acid sequence identity with DC. Like DCX, DCL associates with microtubules, stabilizes the cytoskeleton and induces microtubule polymerization. In contrast to DCX, siRNA mediated knockdown shows a crucial role for DCL in the bundling and stability of mitotic spindles in neuroblastoma cells. Since DCL plays an important role in the proliferation of early neuroblasts, it may be an excellent marker for neurogenesis. To test this hypothesis, we here present a detailed spatiotemporal mapping of DCL protein expression during early mouse development with particular reference to possible differences with DCX and radial glia.

Clearly different, as well as partly overlapping distributions were found for DCX and DCL. Unlike DCX, DCL is already expressed in the neuro-epithelium at embryonic day (ED)8, a timepoint characterized by massive neuronal proliferation, not migration. DCL protein is further found in the ventricular zone, an embryonic brain area known for its extensive neurogenesis. Moreover, DCL is prominent in isolated neuroblasts undergoing mitosis. In adult brain, DCL protein is mainly expressed in the olfactory bulb and hippocampus; also brain regions with ongoing neurogenesis. We conclude that while DCX is important in neuronal migration, DCL appears to be important for the earlier occurring proliferation and division of early neuroblasts and neuro-progenitors. As such, DCL may be a promising novel marker for neurogenesis.

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