Novel developmental functions of the Drosophila SOX gene Dichaete

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Abstract

All multicellular life begins as a single cell—the fertilised egg, from which the adult organism develops. As a general priniciple, as embryos progess through development, changes in cellular status seem to be effected by cell specific transcription factors which regulate specific gene subsets.^ The SOX (Sry box) family of transcription factors are one such developmentally important class of transcription factors, consisting of twenty mammalian proteins that each contain a single High Mobility Group (HMG) DNA binding domain that is >50% homologous to that of Sry, the mammalian testes determining factor. SOX proteins are multi-functional developmental regulators that sequence specifically bind DNA, and can function both as classical transcription factors and as architectural components of chromatin (Kiefer et al. 2007, Lefebvre et al. 2007).^ We have been modeling SOX gene function using the *Drosophila* SOX gene *Dichaete* (D). D has similar biochemical properties to mammalian SOX proteins, and is essential for embryonic segmentation and cell fate specification (Ma et al. 1998, Russell et al. 1996). In this thesis I detail novel functions of *D* in oogenesis and adult olfactory system development.^ Chapter two details D expression and function during oogenesis in *Drosophila.* We show that D is transiently expressed in the oocyte cytoplasm from region 2 of the germarium through stage 8. We demonstrate that D protein can bind *gürken* mRNA, which was mislocalised in *D* mutant egg chambers. These studies contribute to our understanding of the establishment of dorsal/ventral polarity and significantly detail a cytoplasmic role for SOX proteins in binding mRNA (Mukherjee et al., 2006).^ Chapter three details the expression and function of D in the adult *Drosophila* nervous system. I show that D is prominently expressed in a mixture of excitatory and inhibitory local neurons (LNs) and central complex ring neurons. Hypomorphic *D* alleles were generated, and the mutant brains exhibited misplacement and mistargeting of specific olfactory projection neurons. These data greatly enhance our understanding of the development of neuronal connectivity in a discrete neural map represented by the fly antennal lobe, and represent a detailed report of SOX gene expression in the adult brain.^

Subject Area

Neurosciences

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