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Pitx2 Distinguishes Subtypes of Terminally Differentiated Neurons in the Developing Mouse Neuroepithelium

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Abstract

Pitx2, a homeodomain transcription factor, is essential for normal development of pituitary, eyes, heart, and teeth. In the developing mouse brain, *Pitx2* (*Rieg*, *Ptx2*, *Otlx2*, *Brx1*) mRNA is expressed in discrete regions of the diencephalon, mesencephalon, and rhombencephalon. While prior reports have provided an overview of the temporal and regional specificity of *Pitx2* mRNA expression in the brain, the precise cell types that express PITX2 are not known. In this study, we analyzed *Pitx2* mRNA and PITX2 protein expression in individual cells of the developing e10.5–e14.5 mouse CNS using multiple markers of cellular proliferation and differentiation. We identified *Pitx2* expression in nestin-positive neural progenitors and in postmitotic, developing neurons. In the diencephalon, PITX2 is expressed in neurons of the zona limitans intrathalamica and mammillary region and in γ-aminobutyric acid (GABA)-producing neurons of the zona incerta. In the mesencephalon, PITX2-labeled nuclei also appear in differentiated neurons, some of which are GABAergic and destined to occupy superior colliculus. Our results suggest that PITX2 expression in postmitotic neurons may contribute to development of GABAergic and other differentiated neuronal phenotypes.

Keywords

GABA; nestin; GAD67; transcription factor; cell fate determination; proliferation; differentiation

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