SOX3 expression in the glial system of the developing and adult mouse cerebellum

ABSTRACT

Background: The cerebellum plays a vital role in equilibrium, motor control, and motor learning. The discrete neural and glial fates of cerebellar cells are determined by the molecular specifications (e.g. transcription factors) of neuro- progenitor cells that are influenced by local microenvironment signals. In this study, we evaluated the expression and function of Sox3, a single-exon gene located on the X chromosome, in the developing cerebellum. Result: In the embryonic and early postnatal cerebellum, SOX3-positive-cells were detected in the ventricular zone, indicating that SOX3 expression is present in a subset of the cerebellar precursor cell population. In the young adult cerebellum, this expression was diminished in cerebellar cells, suggesting its limited role in cerebellar progenitors. SOX3-positive-cells were also found in the cerebellar mantle zone. Further immunohistochemistry analyses revealed that SOX3 was not expressed in Purkinje neurons. Using glial markers in the early postnatal cerebellum, we found that virtually all of the SOX3-positive-cells were glial cells, although not all glial cells were SOX3-positive-cells. We also determined the impact of transgenic expression using a loss-of-function (Sox3 null) model. We did not observe any developmental defects in the cerebellum of the Sox3 null mice. Conclusions: Our results indicate that the SOX3 protein is not expressed in cerebellar neurons and is instead expressed exclusively in the cerebellar glial system in a subset of mature glial cells. Although the expression of Sox3 cerebellar glial development is lineage-restricted, it appears that the absence of Sox3 in the ventricular germinal epithelium and migrating glia does not affect cerebellar development, suggesting functional redundancy with other SoxB1 subgroup genes.

Keyword: Transcription factor; Cerebellum; Glial cells