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Role of Transcription Factor Gene *Foxb1* in Cerebellar Patterning

Fach/Einrichtung: Anatomie und Zellbiologie

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Background: The cerebellum locates in the mouse posterior brain and it controls motor movements as well as some cognitive functions. The cerebellar circuitry contains several types of neurons that regulate and coordinate balance and movements, the most two important neurons are Purkinje cells and granule cells. *Foxb1* gene is a transcription factor, it expresses in thalamus, hypothalamus, midbrain, hindbrain and ventral spinal cord by midgestation. In thalamus and hypothalamus, *Foxb1* is necessary for access of mammillothalamic axonal bundles. In *Foxb1* mutant mice, the midbrain and mammillary body show dysgenesis or agenesis. *Foxb1* gene has been proved to express strongly in hindbrain and somites from embryos on.

Question: Since *Foxb1* is a transcription factor and a protein encoding gene, it is expressed in midbrain, hindbrain and cerebellum strongly on embryos, we hypothesize *Foxb1* might play an important role in cerebellar development and maturity. What are alterations of cerebellar cell differentiation and constitution of cell types in *Foxb1* homozygous mutant?

Method: In order to demonstrate *Foxb1* involving in cerebellar development and differentiation, I have implemented immunohistochemistry as the dominating method to identify and quantify cell types of *Foxb1* lineage by comparing *Foxb1* heterozygous and homozygous cerebellum. Primary cell culture from cerebellum and immunocytochemistry were also applied to characterize *Foxb1* cell lineage at different ages.

Results: In cerebellum Purkinje cell layer and molecular layer, most of *Foxb1* cell lineage differentiated into Purkinje cells during cerebellar development, some interneurons were also derived from *Foxb1* cell lineage. In white matter of cerebellum, many oligodendrocytes were labeled by *Foxb1* cell lineage reporter. However, neither Bergmann Glial cells nor the granule cells were colocalized with *Foxb1* lineage.

Conclusions: These results indicate *Foxb1* is an essential role in cerebellar development and differentiation. Cerebellar Purkinje cells, basket and stellate interneurons and oligodendrocytes are also belong to *Foxb1* lineage, whereas, granule cells and Bergmann glial cells are not.