Sox2-dependemt regulation of stem cell-like precursors during secondary neurulation

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In vertebrates, the neurulation proceeds by two distinct processes, primary neurulation (PN) and secondary neurulation (SN), which construct the neural tube in the anterior and posterior regions of the body, respectively. We have been studying how the SN process is regulated using chicken embryos, in which PN switches to SN around at the hind limb bud level. During SN, undifferentiated mesenchymal precursors undergo mesenchymal-to-epithelial transition (MET). When EGFP-labeled SN-precursors are orthotopically transplanted to a non-labeled host embryo, these cells are found both in the neural tube and undifferentiated mesenchymal population, suggesting that SN-precursors contain stem cell-like population. To investigate into more details, we divided a mass of SN-precursors into the posterior- and anterior halves, and used each of them for the transplantation. The anterior half participated in the neural tube formation, but did not stay as undifferentiated. In contrast, cells of the posterior half were found in both the neural tube and undifferentiated population in the host. Such distinct behaviors between the anterior- and posterior halves appear to be caused by differential levels of the transcription factor Sox 2. We propose a model that high-level Sox2 drives cells into epithelial differentiation, whereas low-level Sox2 is for the maintenance of the undifferentiated state of SN stem-like cells. We will discuss how the Sox2-dependent cell differentiation is coordinated with MET during SN.