

Abstract

The main functional cells of the inner ear are neurons and sensory cells that are formed from a common embryonic epithelial neurosensory domain. Discovering genes important for specification and differentiation of sensory cells and neurons in the inner ear is a crucial basis for understanding the pathophysiology of hearing loss. Some of these factors are necessary not only for the inner ear but also for the development of other neurosensory systems such as the visual and olfactory system.

The aim of this work was to reveal functions of transcription factor SOX2 in inner ear development by using mouse models with different conditional deletions of *Sox2* gene. *Sox2* gene was deleted by *cre-loxP* recombination.

In *Isl1-cre, Sox2 CKO* mutant, reduced number of hair cells differentiated only in some inner ear organs (utricle, saccule and cochlear base) and not in others (cristae and cochlear apex). Early forming inner ear neurons in the vestibular ganglion and neurons innervating the cochlear base developed in these mutants but died by apoptosis due to the lack of neurotrophic support from sensory cells. Late forming neurons in the cochlear apex never formed.

In *Foxg1-cre, Sox2 CKO* mutant, only rudimental ear with no sensory cells was formed. The initial formation of vestibular ganglion with peripheral and central projections was unaffected, whereas only a few transient neurons of the spiral ganglion were detected. The near-normal formation of early neurons in these mutants suggests that SOX2 is not necessary for early ear neurogenesis. In the absence of SOX2, the early ear placode development proceeded normally but the development of lens and olfactory placodes was abolished.

Neurod1-cre mediated deletion of *Sox2* in *Neurod1-cre, Sox2 CKO* mice did not cause any changes in neurosensory development of the inner ear or hearing functions, suggesting that SOX2 is not necessary for inner ear neuronal development.