A Role for Retinoid-related orphan receptor B (RORB) controls aspects of Somasensory Cortex Development

Abstract

Much of the richness and complexity of our perceptions and motor actions is rooted in the intricate neuronal networks of the cerebral cortex. This six layered structure is subdivided into specialized areas that process specific sensory modalities and motor outputs, with distinct connectivity, cytoarchitecture, and patterns of gene expression. Neurons in layer IV are the primary recipients of sensory input, via relay neurons located in the distinct thalamic nuclei which send their axons to defined cortical areas. Here, I investigated the role of the nuclear orphan receptor RORp, which is specihcally expressed at high levels in layer IV neurons of the somatosensory cortex, in the development of this connectivity and cortical areahzation. I find that in vivo overexpression of RORB during corticogenesis is sufficient to induce the periodic clustering of cortical neurons, which is a cytoarchitectonic hallmark of the somatosensory cortex. Remarkably, despite their ectopic location outside of layer IV, these neuronal clusters appear to be innervated by the axons of thalamocortical neurons (TCA), as indicated by anatomic labeling of TCA and close apposition to selected synaptic markers. Together, these data suggest that the orphan receptor RORB plays a critical role in determining the identity of layer IV neurons and in controlling the targeting specificity of TCA during corticogenesis.