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Regional Rostrocaudal Comparison of Calbindin and Calretinin in the Auditory Cortex

Abstract

In order to develop a foundation for understanding sound and auditory processing, establishing a comprehensive framework of the structural and neurochemical organization of the auditory system is required. The current primate model of auditory cortex consists of three levels of processing that corresponds to three regions: the primary core region, the secondary belt region, and a tertiary parabelt region (Hackett, 2011). Each of these regions are further subdivided into multiple areas that are located in a rostral to caudal axis within auditory cortex. Studies have demonstrated changes in expression patterns of various neurochemical markers between regions (Hackett & de la Mothe, 2009) as well as within a region based on location along the rostrocaudal axis (de la Mothe et al. 2006a). While previous work from the lab has examined expression patterns of calcium binding proteins, a class of GABAergic neurons, focused on caudal auditory cortex, the current study seeks to examine expression patterns in rostral auditory cortical areas. Specifically, we analyzed the rostral sections of the auditory cortex in marmoset monkeys across regions including the core, medial belt, lateral belt, and parabelt for expression and co-expression of two calcium binding proteins, calbindin and calretinin. Multi-fluorescent immunohistochemistry (IHC) was performed in order to visualize several neuro anatomical markers in the same tissue section, in this case the two calcium binding proteins. Cell counts were performed for calbindin and calretinin as well as the co-localization of the two proteins in all regions of rostral auditory cortex in order to identify expression patterns that could then be compared with established patterns from caudal auditory cortex in marmoset monkeys. Results indicate largely distinct populations of calbindin and calretinin in rostral areas across regions with few incidences of co-localization and shifts in expression between regions themselves. In comparison, caudal auditory cortex also expressed largely distinct populations of calbindin and calretinin, however differences were identified with higher numbers of co-localized cells in caudal areas. These findings are consistent with previously reported shifts in architecture and anatomical markers along the rostrocaudal axis in auditory cortex.

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