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Poster presentation

From quantification of 3D morphology of coincidence detector neurons in the MSO to a multi-compartmental model

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In the medial superior olive (MSO), neurons compute the azimuthal location of low frequency sound sources by a temporally precise mechanism of coincidence detection. This type of neuronal processing has been subject to various model predictions based on *in vivo* and *in vitro* data obtained in mammalian MSO and an avian analog brain structure. It is assumed that dendritic morphology of MSO neurons affects this computational process. However, few quantitative data about the morphology of these neuronal coincidence detectors are available from mammals, limiting theoretical approaches. We used single cell electroporation, microscopic reconstruction and compartmentalization to extract anatomical parameters of MSO neurons and quantitatively describe their morphology and their development between postnatal day 9 and 36. The dendritic arborization of higher order dendrites decreases between postnatal day 9 and 21, whereas the dendritic radius increased until P27. The developmental profile of the morphology of MSO neurons shows that maturation is reached two weeks after hearing onset. In general, we find that at postnatal days older than P27 the neurons of the gerbil MSO are bipolar, morphologically compact, cylinder-like cells with axons originating from the soma. The obtained geometry of these cells was then used to establish multi-compartmental models to quantify the influence of morphological and developmental changes on the integration of synaptic currents. To increase computational and programming efficiency of the simulations, we developed a Python-based object-oriented library.