学 位 の 種 類	博士（医学）
報 告 番 号	甲第１６４２号
学 位 記 番 号	第１１７７号
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授 与 年 月 日	平成 30 年 3 月 26 日
学位論文の題名	Distribution of ASIC4 transcripts in the adult wild-type mouse brain （野生型成獣マウス脳における ASIC4 メッセンジャーRNA の分布） Neuroscience Lett 651, 57-64 (2017)
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Abstract

Acid-sensing ion channels (ASICs) are neuronal members of the Deg/ENaC superfamily of cation channels. There are at least six subunit proteins (ASIC1a, ASIC1b, ASIC2a, ASIC2b, ASIC3 and ASIC4) in mammals. ASIC4 is the least understood subtype because its channel properties remain unknown. Previous studies of ASIC4 expression in the mammalian central nervous system have shown that ASIC4 is abundantly expressed in the spinal cord and in various brain regions, such as the cerebral cortex, the hippocampus, and the cerebellum. However, the detailed distribution of ASIC4 transcripts in mammalian brains still remains elusive. In the present study, radioactive *in situ* hybridization histochemistry with an ASIC4-specific cRNA probe was performed on wild-type mouse brains, followed by X-gal staining experiments with Asic4-lacZ reporter mice. It was found that ASIC4 mRNAs were widely expressed throughout the wild-type brain, but preferentially concentrated in the olfactory bulb, the piriform cortex, the caudate putamen, the preoptic area, the paraventricular nucleus, the medial habenular nucleus, the pretectal area, the lateral geniculate nucleus, the amygdaloid complex, the superior colliculus, the interpeduncular nucleus, and the granule cell layer of the ventral hippocampus, and these results were in agreement with the X-gal-positive reactions observed in the mutant brain. In addition, X-gal staining combined with immunohistochemistry identified intense signals for ASIC4 transcriptional activity in most of the choline acetyltransferase (ChAT)-positive principal neurons located in the basal forebrain cholinergic nuclei. Our data provide useful information to speculate possible roles of ASIC4 in diverse brain functions.