

The $\alpha 2$ -Subunit of the Nicotinic Cholinergic Receptor Is Specifically Expressed in Medial Subpallium-Derived Cells of Mammalian Amygdala

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ABSTRACT

Nicotinic acetylcholine receptor (nAChR) subtypes are expressed in specific neuronal populations, which are involved in numerous neural functions such as sleep, fatigue, anxiety, and cognition, as well as the central processing of pain and food intake. Moreover, mutations in nAChRs subunits have been related to frontal lobe epilepsy, neurodegenerative diseases, and other neurological disorders, including schizophrenia and attention deficit and hyperactivity disorder (ADHD). Previous studies have shown that the $\alpha 2$ -subunit of the AChR (Chrna2) is expressed in the basal forebrain, in the septum, and in some amygdalar nuclei in the adult rodent brain. However, although the importance of this

amygdalar expression in emotion-related behavior and the physiopathology of neuropsychiatric disorders has been accepted, a detailed study of the Chrna2 expression pattern during development has been lacking. In this study we found that Chrna2 is specifically expressed in medial subpallium-derived amygdalar nuclei from early developmental stages to adult. This finding could help us to better understand the role of Chrna2 in the differentiation and functional maturation of amygdalar neurons involved in cholinergic-regulated emotional behavior. *J. Comp. Neurol.* 523:1608–1621, 2015.

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Acetylcholine (ACh) is a neurotransmitter released by cholinergic neurons. Neural cells respond to ACh signal through acetylcholine receptors, both muscarinic and nicotinic. Nicotinic ACh receptor (nAChR) subtypes are widely expressed in the peripheral and central nervous system, where they regulate multiple processes related to cell excitability and activity integration in neuronal circuits. These neural processes are crucial for cognition, sleep, anxiety, food intake, and the central processing of pain (McGehee and Role, 1995; Role and Berg, 1996; Gotti et al., 1997; Lindstrom, 1997; Changeux and Edelman, 2001; Hogg and Bertrand, 2003). nAChRs are preferentially located at the preterminal and presynaptic sites of neuropils regulating the release of ACh, noradrenaline, dopamine, and γ -aminobutyric acid (GABA) neurotransmitters (Gotti et al., 2006). Moreover, alterations in nAChRs seem to constitute risk factors for neurodegenerative diseases

as Alzheimer's and Parkinson and neurological disorders including epilepsy, schizophrenia, and attention deficit and hyperactivity disorder (ADHD) (Freedman et al., 1997; Steinlein et al., 1999; Jones et al., 1999; Paterson and Nordberg, 2000; Dani, 2001; Grothe et al., 2009; Posadas et al., 2013). Finally, in the amygdala, nAChR signaling plays a significant role in working-

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