Medullary noradrenergic neurons projecting to the bed nucleus of the stria terminalis express mRNA for the NMDA-NR1 receptor

M. I. Forray, K. Gysling, M. E. Andrés, G. Bustos, S. Araneda

Abstract

The bed nucleus of the stria terminalis pars ventralis (vBNST) receives dense noradrenergic terminals and contains the highest concentration of noradrenaline (NA) in the brain. We used autoradiography following retrograde axonal transport of [^{3}H]-NA to identify selectively whether noradrenergic neurons innervating the vBNST originate in the medulla oblongata and/or the locus coeruleus. In combination with this technique, non-isotopic *in situ* hybridization for the NMDA-NR1 receptor subunit mRNA was used to examine, on the same brain sections, its expression in noradrenergic neurons that innervate the vBNST. The results showed that 60 ± 6% and 35 ± 7% of the total number of radiolabeled cells detected after injection of [^{3}H]-NA in the vBNST were located in brainstems A1 and A2 noradrenergic cell groups, respectively. In addition, 18.5 ± 4.2% of radiolabeled cells in A1 and 15.7 ± 5% in A2 also expressed the mRNA for the NMDA-NR1 receptor subunit. In contrast, only 4 ± 3% of the radiolabeled cells were present in the locus coeruleus, and none of these cells was positive to NMDA-NR1 receptor subunit mRNA. The present results provide evidence that BNST noradrenergic fibers and terminals originate predominantly from A1 and A2 noradrenergic cell groups, and that a significant number of these noradrenergic neurons also express the mRNA for the NMDA-NR1 receptor subunit. The observation that brainstem noradrenergic neurons innervating the vBNST express NMDA receptor mRNA gives anatomical support to the regulation of NA release by NMDA presynaptic receptors.