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Developing Strategies for Anatomical Characterization of Locus Coeruleus – Cortical Projections

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ABSTRACT

The locus coeruleus (LC) is a small noradrenergic nucleus located in the midbrain that releases the neurotransmitter norepinephrine to diverse brain regions. Through release of norepinephrine, the LC plays a central role in modulating numerous physiological functions including attention, arousal, and mood and behavior. Although the LC projects to many brain region, there is limited information about the organization and the afferent projections to the LC that modulates its activity. The goal of this study was to characterize the anatomical projections between LC and cortical areas using a variety of different experimental techniques, including survival brain surgery, stereotaxic injections of fluorescent dyes, trans-cardiac perfusion, and immunohistochemistry. To determine cortical projections from different brain regions to the locus coeruleus, we injected the retrograde fluorescent tracer Fast Blue into the LC. Immunolabeling technique using dopamine- β -hydroxylase antibody allowed for detection of norepinephrine neurons and their extensive projections. The results from the experiment after microscopic imaging of the histology slices do not reveal a direct projection from the visual cortex to the locus coeruleus.

KEYWORDS

Locus coeruleus, retrograde tracing, immunohistochemistry, stereotaxic