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LARGE, MULTIPOLAR NEURONS OF THE BASAL FOREBRAIN HAVE CHOLINERGIC PROJECTIONS TO THE SENSORIMOTOR CORTEX OF THE CAT

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RIBAK, Charles E. and Warren KRAMER\*, Department of Anatomy, University of California, Irvine, California. Large, multipolar neurons of the basal forebrain have cholinergic projections to the sensorimotor cortex of the cat.

Other investigators have previously reported a projection from the substantia innominata to the sensorimotor cortex in the monkey and rat. Evidence is accumulating that this group of cortical afferents utilizes acetylcholine as a neurotransmitter. Since similar studies have not been made in the cat, the following study was undertaken to analyze the extent and distribution of this projection from the basal forebrain. Horseradish peroxidase (HRP) injections were made into the anterior and posterior sigmoid gyri 24 h. before sacrifice, and DFP was injected intramuscularly 3 h. before sacrifice. The cats were perfused and brain sections were incubated in solutions to simultaneously detect retrogradely transported HRP and acetylcholinesterase (AChE) reaction product within somata (Mesulam and Rosene, 1978). The cell bodies that contained reaction product for both HRP and AChE were large (25-30 microns) and multipolar. These double-labelled cells were located in (1) the nucleus of the diagonal band in rostral sections, (2) the globus pallidus and substantia innominata at the level of the anterior commissure, and (3) the lateral hypothalamus in the most caudal sections. Many of these sites correspond to that for the nucleus basalis, an aggregation of large multipolar neurons scattered throughout the basal forebrain. Although the presence of AChE does not define a cholinergic neuron, recent studies indicate that its presence is a requirement for this neurotransmitter. In addition, immunocytochemical methods have demonstrated that large, multipolar neurons in the basal forebrain of the cat contain the synthesizing enzyme for acetylcholine (McGeer et al.). Together these data indicate that a cholinergic projection to the sensorimotor cortex of cats arises from the basal forebrain. This pathway may play a vital role in memory and cognition.

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