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Control/Tracking Number: 2008-S-104218-SfN

Activity: Scientific Abstract

Current Date/Time: 5/14/2008 8:49:06 AM

Connections of the lateral posterior thalamic nucleus with cingulate and medial agranular cortex related to circuitry for directed attention in rats.

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Abstract:

The lateral posterior thalamic nucleus (LP) has been implicated as a central component of the neural circuitry that mediates directed attention in rats and its dysfunctional counterpart, contralateral neglect. Previous studies have shown that LP has reciprocal connections with the medial agranular (AGm) and posterior parietal (PPC) cortex. Unilateral lesions of AGm or PPC produce multimodal contralateral neglect. Previously we found that projections from LP to AGm originate in far medial LP (fmLP). Additionally, fmLP projects to the dorsocentral striatum (DCS), which receives convergent input from AGm and PPC and is essential for recovery from neglect. Previous axonal tracing findings suggested that fmLP projects to cingulate cortex as well as to AGm. Therefore, in the present study, we used double (red/green) injections of the retrograde axonal tracer cholera toxin subunit B in CG1 and AGm to determine the topography of their inputs from fmLP. Our results revealed that cortical area CG1 receives input from the dorsal part of fmLP, whereas the adjacent ventral part of fmLP projects to AGm. Injections of the anterograde tracer 10k biotinylated dextran amine centered in dorsal or ventral fmLP confirmed these findings; dorsal fmLP projects most densely to the caudal half of CG1, whereas ventral fmLP projects more extensively throughout the rostrocaudal extent of AGm. These anterograde cases also suggest that ventral fmLP projects to central DCS as well as to the dorsal band peripheral to DCS, whereas dorsal fmLP projects lightly and almost exclusively to the dorsal band. These results add to our previous findings on the topography of the connections of LP, and suggest that cingulate cortex is involved in rat contralateral neglect, as it is known to be in human neglect.

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Theme and Topic (Complete): D.15.d. Systems physiology and behavior

Keywords (Complete): NEGLECT ; ATTENTION ; TRACT TRACING

Presentation Preference (Complete): Poster Only

Support (Complete):

Support: Yes

Grant/Other Support: : NIMH Grant MH60399

Linking Group (Complete): None selected

Special Requests (Complete):

Religious Conflict?: No Religious Conflict

Additional Conflict?: No

Status: Finalized

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