Mapping synaptic cortico-claustral connectivity in the mouse.

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Created 4/16/2016
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Abstract:

The claustrum is an intriguing brain structure, featuring the highest connectivity per regional volume in the brain. It is a thin and elongated structure enclosed between the striatum and the insular cortex, with widespread reciprocal connections with the sensory modalities and prefrontal cortices. Retinotopic and somatotopic organizations have been described in the claustrum, and anatomical studies in cats, monkeys, and rats have demonstrated topographic organization of cortico-claustral connections. In this study, we mapped the projections from cortical modalities (visual, auditory, somatosensory, motor and olfactory), and prefrontal regions (anterior cingulate cortex and orbitofrontal cortex) to the claustrum in mice. Utilizing expression of a virally-encoded synaptic anterograde tracer, AAV-SynaptoTag, followed by 3-dimensional reconstruction of the cortical projections, we performed a comprehensive study of the organization of these projections within the mouse claustrum. Our results clearly demonstrate a dorsoventral laminar organization of projections from the sensory cortices to the claustrum, whereas frontal inputs are more extensive and overlap with the inputs from the sensory cortices. In addition, we find evidence in support of a core/shell organization of the claustrum. We propose that the overlap between the frontal inputs and the inputs from the sensory modalities may underlie executive regulation of the communication between the claustrum and the cortical modalities. This article is protected by copyright. All rights reserved.

Journal:
The Journal of comparative neurology

Date Published:
2016 Mar 12

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