BDR SEMINAR (Kobe & online hybrid)

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Monday, August 3, 2026

11:00-12:00

E206 Seminar room, DB Building D, Kobe / Broadcast online via Zoom

※This seminar is open only for BDR members

The neural circuitry and coding of interoception

Summary

The interoceptive system enables the brain to detect signals from internal organs?stomach distension, intestinal nutrients, airway irritants, blood pressure, oxygen saturation?to maintain bodily homeostasis. The nucleus of the solitary tract (NTS) in the brainstem is the brain's primary interoceptive hub. It integrates and processes convergent sensory inputs from visceral organs via the vagus nerve and spinal cord, transmitting signals to higher-order brain regions to regulate behavior, physiology, and metabolism. Despite its importance, the principles by which the NTS organizes peripheral information to mediate these complex responses remain poorly understood. Here we develop a novel in vivo two-photon brainstem imaging platform, which allows us to record the activities of thousands of NTS neurons simultaneously. We discover that the NTS creates a map of internal organs that takes the shape of a "visceral homunculus". This topography requires brainstem inhibition, as blockade of inhibition broadens neuronal tuning and disrupts spatial organization. Combining brainstem imaging with genetic strategies to label targeted populations of NTS neurons, we show that the NTS creates parallel viscerosensory pathways. These pathways are distributed across the topographic map of internal organs and are similarly tuned to respond to various viscerosensory stimuli but differentially control behavior and metabolism. Our work establishes the conceptual framework of the organizational logic of the brainstem interoceptive circuits.

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