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Dissecting a Feeding Circuit between the Extended Amagdala and Parabrachial Regions

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Dissecting a Feeding Circuit between the Extended Amygdala and Parabrachial Regions

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The bed nucleus of the stria terminalis (BNST) is a structure in the limbic system of the brain known to integrate information related to external threats, while the parabrachial nucleus (PBN) in the brainstem is involved in metabolic signaling, taste sensation, and feeding. Due to these combined roles, the interactions between these two regions may strongly influence food-seeking and exploratory foraging-like behaviors. This project investigates the anatomical structure and behavioral responses associated with the neural circuit projecting from the BNST to the PBN through GABAergic (inhibitory) and glutamatergic (excitatory) neurons.

To understand these BNST-PBN anatomical connections, we utilized cutting-edge retrograde viral tracing methods to identify the source of projections onto the PBN. These tracers showed both GABAergic and glutamatergic neurons projecting from the BNST onto the PBN. For investigating the behavioral implications of this circuit's actions, we injected cre-dependent viruses into the BNST of VGLUT-Cre and VGAT-Cre mouse lines to selectively express an inhibitory optogenetic proteins in either glutamatergic and GABAergic projections. We then used fiber optic implants to deliver optogenetic stimulation directly to these neuronal projections. In doing so, we found that activation of these GABAergic neurons in the BNST-PBN circuit results in increased feeding and an increased exploratory behavior, and mice showed a robust place preference for this activation. Alternatively, activation of the glutamate neurons decreased feeding, and mice showed a strong aversion to activation of these neuronal projections in the PBN. These findings implicate a mechanism by which the brain balances metabolic needs with external threats, and further analyses to explore these interactions are ongoing.