

Publication

A V0 core neuronal circuit for inspiration

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Breathing in mammals relies on permanent rhythmic and bilaterally synchronized contractions of inspiratory pump muscles. These motor drives emerge from interactions between critical sets of brainstem neurons whose origins and synaptic ordered organization remain obscure. Here, we show, using a virus-based transsynaptic tracing strategy from the diaphragm muscle in the mouse, that the principal inspiratory premotor neurons share V0 identity with, and are connected by, neurons of the preBötzinger complex that paces inspiration. Deleting the commissural projections of V0s results in left-right desynchronized inspiratory motor commands in reduced brain preparations and breathing at birth. This work reveals the existence of a core inspiratory circuit in which V0 to V0 synapses enabling function of the rhythm generator also direct its output to secure bilaterally coordinated contractions of inspiratory effector muscles required for efficient breathing. The developmental origin and functional organization of the brainstem breathing circuits are poorly understood. Here using virus-based circuit-mapping approaches in mice, the authors reveal the lineage, neurotransmitter phenotype, and connectivity patterns of phrenic premotor neurons, which are a crucial component of the inspiratory circuit.

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