

Respiratory rhythm generation and central chemoreceptors in rodents

Hiroshi Onimaru

Department of Physiology, Showa University School of Medicine, 1-5-8 Hatanodai, Shinagawa-ku, Tokyo 142-8555, Japan

The brainstem contains neurons that participate in the generation of respiratory rhythm activity and other neurons that mediate input by peripheral and central stimuli. There is growing evidence that in mammals, two distinct neuronal networks in the ventrolateral medulla (VLM) are involved in respiratory rhythm generation. One is the pre-Bötzinger complex (pre-BötC), which is located in the rostral ventrolateral medulla and produces inspiratory (Insp) neuron bursts. The other is the parafacial respiratory group (pFRG), which is located in more rostral medulla and produces predominantly preinspiratory (Pre-I) neuron bursts. Interaction between the pFRG/Pre-I rhythm generator and the pre-BötC/Insp rhythm generator is important for the production of respiratory rhythm, although they are also able to work independently, at least under manipulated conditions in newborn and juvenile rats. We recently showed that a subgroup of pFRG/Pre-I neurons expresses a transcription factor, Phox2b and is postsynaptically sensitive to hypercapnic stimulation (i.e. intrinsically CO₂ sensitive). Thus, pFRG/Pre-I neurons play a role in central chemoreception as well as respiratory rhythm generation and are essential for postnatal survival. In my presentation, I focus on these recent findings and discuss the organization of medullary respiratory neuron networks of rodents and the functional role of pFRG/Pre-I neurons.