PROCESSING OF AFFERENT SIGNAL RESULTING IN COUGH RESPONSE

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Cough, the most important airways defensive mechanism is modulated by many afferent inputs mainly from respiratory tussigenic areas, but also by afferent drive from other organs. Vagal afferents are critical in evoking as well as modulating cough by mechanical and chemical stimuli in the airways (Canning et al., 2006).

Reduced cough primary and secondary (modulatory) vagal afferent drive (unilateral vagal cooling or unilateral vagotomy) lowered markedly cough responsiveness (number of cough induced), the motor drive to respiratory pump muscles and altered cough temporal features. Simulations of reduced primary cough afferent drive using the computer model of neuronal network generating breathing and coughing resulted in similar effects on cough.

Pitts et al. (2016) investigated the hypothesis that the second-order neurons in the nucleus tractus solitarius (the site of central termination of vagal afferents) act as a filter and shape afferent input to the neuronal network producing the cough response. The results are consistent with serial and parallel processing of airway afferent signals in the nucleus tractus solitarius resulting in generation and formation of the cough motor pattern.

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Canning B.J. Anatomy and neurophysiology of the cough reflex: Anatomy and neurophysiology of the cough reflex: ACCP evidence-based clinical practice guidelines. Chest. 2006; 129: 33-47.

Pitts T, Morris KF, Segers LS, et al. Feed-forward and reciprocal inhibition for gain and phase timing control in a computational model of repetitive cough. Journal of Applied Physiology. 2016;121(1): 268-278.