



Physiology of Respiration and Cough

Cough is a vital reflex, allowing for clearance of inhaled particulate matter, irritants, secretions. Cough as a disease is a symptom of a variety of laryngeal and pulmonary disorders, ranging from inflammatory and reactive processes, to malignancies and functional disorders. The diagnosis of the cause for cough is made based on history, medication review, complete physical exam, and appropriate imaging. Treatment for chronic cough can include behavioral therapy as well as focused pharmacological intervention, both local and systemic.

Anatomy and Physiology

- Cough is evoked by the stimulation of bronchopulmonary c-fibers and mechanically sensitive subtype of myelinated airway mechanoreceptors
- Laryngopharyngeal cough is provoked by activation of vagal afferent fibers terminating in extrapulmonary mucosa
- Cough is reflexive in nature, but is sensitive to sub-cortical processing, and modification by the cognitive and emotional centers in the cortex

Canning BJ, Chang AB, Bolser DC, Smith JA, Mazzone SB, McGarvey L; CHEST Expert Cough Panel. Anatomy and neurophysiology of cough: CHEST Guideline and Expert Panel report. *Chest*. 2014 Dec;146(6):1633-1648

Assessment

- Diagnosis for cause of chronic cough is initiated with comprehensive physical exam including evaluation of the nasal and pharyngeal mucosa and auscultation of the lungs
- Nasal endoscopy and laryngopharyngoscopy should be employed, when anatomical or inflammatory processes in such anatomical regions are suspected
- Patients with chronic cough (lasting >8 weeks) should complete chest radiography and spirometry

Irwin RS. Introduction to the diagnosis and management of cough: ACCP evidence-based clinical practice guidelines. *Chest*. 2006 Jan;129(1Suppl):25S-27S.

Pathophysiology

- Chemical stimulation of nociceptor nerve endings during both inhalation and exhalation, transmission via C-fibers to the nucleus tractus solitarius, which, with modification by the ventral respiratory group, results in the motor response by respiratory muscles
- The most sensitive regions for elicitation of cough are the larynx and the bifurcations of the trachea and bronchi



Canning BJ. Afferent nerves regulating the cough reflex: mechanisms and mediators of cough in disease. *Otolaryngol Clin North Am.* 2010 Feb;43(1):15-25

Treatment

- Treatment is dependent on eliminating the inciting factors, including chemical irritants, gastroesophageal reflux, allergens, or medications (e.g. ACE inhibitor)
- Upper airway cough syndrome should be treated with a combination of intranasal corticosteroids, saline nasal rinses, nasal anticholinergics, and antihistamines
- Reactive airway disease (asthma, COPD) should be managed with a combination of medications that include an inhaled bronchodilator and high-dose inhaled corticosteroid
- Cough management therapy has been shown to provide benefit in laryngeal sourced chronic cough
- Gabapentin and neuromodulators should be reserved for neuropathic or refractory cough, after evaluation for and reasonable trials of pharmacologic medications have been employed for more common causes (rhinosinusitis, pulmonary, and gastroesophageal).

Vertigan AE, Kapela SL, Ryan NM, Birring SS, McElduff P, Gibson PG. Pregabalin and Speech Pathology Combination Therapy for Refractory Chronic Cough: A Randomized Controlled Trial. *Chest.* 2016 Mar;149(3):639-48.

Michaudet C, Malaty J. Chronic Cough: Evaluation and Management. *Am Fam Physician.* 2017 Nov 1;96(9):575-580.