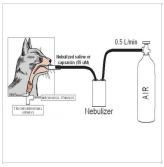

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SPARC_Bolser- Stimulation of Upper Airway Afferents with Capsaicin and Section of the Superior Laryngeal Nerve Modulate Mechanically Induced Coughing from the Tracheobronchial Airways

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1 *Works for me* dx.doi.org/10.17504/protocols.io.bufantie

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ABSTRACT

Airway diseases that induce coughing often involve perturbation of sensory feedback from both the upper and lower airways. We speculated that stimulation of upper airway TRPV-1 receptors with capsaicin would enhance coughing induced from the tracheobronchial airways. Further, we hypothesized that this enhancement would be eliminated by section of the superior laryngeal nerves, a primary sensory pathway from the larynx. Cats of either sex (n=5 males, 5 females) were anesthetized, tracheotomized and allowed to spontaneously breathe. The upper airway was isolated by sealing the mouth around a cannula and inserting a port into the upper trachea rostral to the tracheal cannula. Humidified air or humidified air plus capsaicin (55 mM, ultrasonic nebulizer) (500 ml/min) was passed into the mouth and out the trachea at the level of the 4th tracheal ring. Parasternal and abdominal muscle EMGs were recorded along with esophageal pressure. Cough was elicited by mechanical stimulation of the tracheobronchial airways with a flexible cannula. Aerosolization of capsaicin into the upper airway had no effect on cough number in males or females. In males but not females, SLN section resulted in an increase in cough number of approximately 20% that was not affected by capsaicin administration. Esophageal pressure, parasternal and abdominal muscle EMGs all significantly increased by up to 50% during capsaicin administration in males but not females. These effects in males were eliminated by section of the superior laryngeal nerves (SLN), whereas SLN section had no effect on esophageal pressure or respiratory muscle EMG magnitudes during coughing in females. These results support a complex and sex specific role for SLN afferents in the regulation of tracheobronchial cough. In males, elimination of SLN afferent feedback disinhibits cough number but blocks the enhancement of cough intensity by capsaicin-sensitive afferents in the upper airways. Given that our method of administration exposed the entire upper airway to capsaicin, it is possible that our results revealed multiple actions of upper airway afferents traveling in SLN and non-SLN pathways. The role of non-SLN mediated upper airway afferents in the regulation of cough is poorly understood. Our results suggest that in an animal model, the regulation of cough from the lower airways in males significantly differs than in females.

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Cough, cat, respiratory muscles

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1 Anesthetize animal with 2% sevoflurane. Once anesthetized, wean onto sodium pentobarbital anesthesia (28 mg/kg, iv). Animals will be allowed to spontaneously breathe.

2 Place femoral venous and arterial catheters, a urinary catheter, and cannulate trachea. Record esophageal pressure via a balloon catheter placed in the midthoracic esophagus. Record arterial blood pressure and end tidal CO2. Periodic arterial blood gases are recorded.

3 Place electromyogram (EMG) electrodes in upper airway and chest wall muscles. Electrodes consist of biploar fine insulated wires that are placed several mm apart in each muscle.

Muscles included are: parasternal, diaphragm, transversus abdominis, thyroarytenoid, cricopharyngeus, thyropharyngeus, thyrohyoid, genioglossus, mylohyoid, and geniohyoid.

4 Isolate upper airway by sealing mouth around a cannula using dental impression compound. insert a port into the upper trachea rostral to the tracheal cannula at the 4th tracheal ring.

Pass nebulized 0.55% ethanol in saline plus air or humidified air plus capsaicin (55 micromolar) through the mouth and out of the trachea using an ultrasonic nebulizer (500 mL/min).

5 Tracheobronchial cough is induced by mechanical stimulation of the intrathoracic trachea with a small flexible cannula. The cannula will be rotated at approximately 2 Hz for trial durations of 10 sec each.

6

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