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SPARC_Bolser_intrathoracic vagotomy and cough

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1 Works for me dx.doi.org/10.17504/protocols.io.bgm5ju86

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ABSTRACT

Cervical vagotomy sections both lower airway and recurrent laryngeal afferent fibers and eliminates cough induced by stimulation of sensory afferents in the lower trachea and intrathoracic airways. In the guinea pig, recurrent laryngeal afferent fibers are primarily responsible for cough in response to mechanical or chemical stimulation of the upper trachea and larynx. Further, it has been proposed that lower airway slowly adapting receptors have a permissive effect on the cough reflex. The objective of this study was to determine the role of lower airway vagal afferent fibers on the cough reflex in the cat. We hypothesized that cough induced by mechanical or chemical stimuli applied to the lower airways or the larynx of this species would be depressed after vagotomy below the branch of the recurrent laryngeal nerve. Experiments were conducted in four anesthetized, bilaterally thoracotomized, and artificially ventilated cats. Artificial ventilation was accomplished via a tracheal cannula placed through an incision in the tenth trachea ring. Mechanical (via a flexible cannula through a small port in the trachea tube) or chemical (capsaicin, 0.5 cc, 10 µM) stimulation of the intrathoracic airway was employed during mechanical ventilation. Thoracic vagotomy virtually eliminated the cough response to mechanical stimulation of the lower airways. The cough response to mechanical stimulation of the larynx was also depressed after thoracic vagotomy. Capsaicin introduced into the intrathoracic trachea only elicited cough in two animals but this response was eliminated in both animals by thoracic vagotomy. The results support an important role of lower airway sensory feedback in the production of cough in the anesthetized cat. Further, in the presence of intact recurrent laryngeal nerves, the excitability of cough induced from the larynx is strongly influenced by sensory feedback from the lower airways.

1 Anesthetize animal with 2% sevoflurane. Once anesthetized, wean onto sodium pentobarbital anesthesia (28 mg/kg, iv)

2 Place femoral venous and arterial catheters, a urinary catheter, and cannulate trachea. 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 Animals will be placed on a mechanical ventilator. Bilateral incisions into the chestwall at T4 will be made. The Intrathoracic vagus will be sectioned bilaterally caudal to the branch of the recurrent larygeal nerves.

5 Cough will be induced by mechanical stimulation of the intrathroacic trachea with a small flexible cannula. This cannula will be introduced into the airway via a small hole in the tracheal tube. The cannula will be rotated at approximately 2 Hz for trial durations of 10 sec each. Cough will also be induced by injection of capsaicin (0.5 cc, 10 micromolar) into the intrathoracic trachea via the small hole in the tracheal tube.

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6 Both mechanical and chemical cough stimulation trials will be perfomed before and after intrathoracic vagotomy. Mechanical cough trials will also be performed just after thoracotomy but before vagotomy. Following intrathoracic vagotomy, positive end expiratory pressure will be varied in steps from 0-5cm H2O and mechanically-induced cough trails will be performed.

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