

# **Updates in Antitussive and Bronchodilatory Therapies**

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This presentation will provide an overview of the physiology of cough, major causes of cough in small animals, as well as current and emerging therapeutic options: including antitussives, bronchodilators, inhaled therapies, and adjunctive agents. Cough is defined as a “protective reflex induced by sensory stimuli within the respiratory tract”, serving to expel foreign material, mucus, and irritants. The cough reflex arc involves sensory receptors (RARs, SARs, and C-fibers) in the airways and lung tissue, vagal afferents from the respiratory tract, brainstem integration in the nucleus tractus solitarius (NTS), and coordinated motor output. Five major categories of disease can cause cough: primary pulmonary disease, cardiac disease, lower airway disease, upper airway/laryngeal disorders, and pleural space disease. Because chronic coughing can negatively affect sleep, airway integrity, and quality of life, antitussive therapy is often warranted once an underlying disease is diagnosed and addressed.

Current antitussive options include centrally acting opioids such as hydrocodone and butorphanol. Hydrocodone (0.5–1.5 mg/kg PO q8h) is a potent antitussive but requires caution in cats. Butorphanol is highly effective and available in oral and injectable forms. Diphenoxylate (Lomotil®) provides mild antitussive benefit but may cause constipation. Maropitant (Cerenia®), an NK-1 receptor antagonist, has demonstrated a reduction in cough frequency in dogs with chronic neutrophilic bronchitis. Peripherally acting benzonatate decreases vagal afferent input but carries some risks of side effects. Each of these drugs will be discussed with a coordinated treatment plan being developed. Amitriptyline, though not formally studied in veterinary patients for the problem of cough, may reduce cough via its’ neuromodulatory effects. The presentation will also highlight emerging therapies such as zafirlukast, a leukotriene receptor antagonist with early evidence of benefit in refractory canine bronchitis, and P2X3 antagonists like gefapixant, which show profound cough reduction in human medicine and promising safety data in dogs.

Bronchodilators play a key role in managing lower airway disease by reducing airway smooth muscle contraction, reducing airway resistance to ventilatory efforts, improving ventilation efficiency, and enhancing mucociliary clearance. Mechanisms include  $\beta$ 2-agonism (e.g., albuterol, terbutaline, salmeterol, olodaterol), phosphodiesterase inhibition (theophylline, aminophylline, doxofylline), and anticholinergic blockade (ipratropium,

tiotropium). Theophylline remains in use but has significant drug interactions and side effects. Doxofylline, described as “not just another theophylline!”, offers similar bronchodilation with fewer adverse effects, though it is not yet widely available in the U.S. Airway inflammation amplifies cough by sensitizing airway nerves, increasing mucus, and promoting airway hyperresponsiveness. Inhaled corticosteroids—particularly fluticasone—are central to long-term management of chronic bronchitis and feline asthma providing high local drug concentrations with fewer systemic effects and possibly improved patient compliance. Finally, the presentation will mention herbal and non-pharmaceutical agents, noting limited evidence for most remedies, and cautions against ineffective or harmful treatments such as dextromethorphan and nebulized acetylcysteine.