Canine Aerosol Drug Delivery
Canine Chronic Bronchitis

- Dogs diagnosed with chronic bronchitis are typically over six years of age
- There does not seem to be a clear sex or breed tendency. However, small and toy breeds such as Poodles and Pomeranians seem to have a higher prevalence
The symptoms of asthma can mimic other diseases such as heartworm, pneumonia and congestive heart failure (Padrid, *Use of Inhaled Medications to Treat Respiratory Diseases in Dogs and Cats*. JAAHA 42: 165-169, 2006)

- Canine Chronic Bronchitis cannot be cured, but can be controlled
Prognosis

- Prognosis varies in this disease. In most cases, permanent damage to the airways has occurred and the disease cannot be cured.
- Symptoms can usually be controlled and further damage to the bronchi can be stopped or slowed.
- Periodic relapses of cough are not unusual and require medical management.¹

Traditional Treatment

- Historically, the most effective treatments for noninfectious airway inflammation have been injectable and oral corticosteroids (e.g. prednisone)

- There are a number of potential systemic side effects including behavioral changes, polydipsia, polyuria, increased appetite, skin and urinary tract infections, pancreatitis and diabetes¹

- Aerosol drug delivery provides many benefits including potential for attaining high drug concentration at disease state with minimal systemic absorption. (Cohn LA, Inhalant therapy: Finding its place in small-animal practice. Veterinary Medicine, July 2009)

Metered Dose Inhalers

There are two main categories of drugs available in MDI format:
1) Corticosteroids – for control of the inflammation that causes respiratory symptoms
2) Bronchodilators – for quick relief of symptoms

- Metered Dose Inhalers (MDIs) are the most prescribed drug format for respiratory medications because they act quickly, at the site and with few side effects.
Corticosteroids

- Most effective long-term treatment of persistent canine bronchitis
- Reduce chronic inflammation
- No significant side effects
- Referred to as “preventer” or “controller” medication
- Fluticasone Propionate (Flovent† – GSK)

- Most commonly prescribed corticosteroid inhaler is Fluticasone Propionate (Flovent†) – Available in 44, 110, 220 mcg dose per actuation (USA) (Nationally – 50, 125, 250 mcg dose per actuation)
- Other types include: Flunisolide (Aerobid†), Budesonide (Pulmicort†) and Beclomethasone Dipropionate (Beclovent†, Vanceril†, Qvar†)
- Inhaled corticosteroids pose no significant side effects with limited absorption into bloodstream
- Potential side effects:
  - Growth retardation in children with incomplete closure of growth plates was a concern, it has not been recognized in dogs
  - Candida (yeast) infection of the oropharynx in adults - Not recognized in dogs (usual symptom is dysphonia or hoarseness)
  - (Source: Padrid P. Inhaled Steroid for Asthma, Bronchitis Non Infectious Rhinitis. Fluticasone Propionate - Flovent†, 2009.)
Bronchodilators

- Provide quick relief of symptoms
- Help reverse airway smooth muscle spasm
- Maybe be used as needed for dogs with acute cough, wheeze or increased respiratory rate and/or effort
- Referred to as “rescue” or “reliever” medication
- Albuterol Sulfate - available through a number of different manufacturers

- Provide quick relief of symptoms
- Inhaled bronchodilator drugs work more quickly and have fewer side effects than bronchodilator drugs given by other routes
- Albuterol (Salbutamol) is available from a number of different manufacturers and is often prescribed as Ventolin† or Proventil†
- Potential Side Effects:
  - Musculoskeletal twitchiness, tachycardia
  - Excitability, insomnia, anorexia
  - These side effects should wane within a few hours
- (Source: Padrid, Feline Asthma Therapy - Inhaled Bronchodilator. Albuterol HFA (PROVENTIL 8.5g, VENTOLIN 90mcg))
Many MDIs deliver a dose at over 100km per hour (Newman S. *Principles of Metered Dose Inhaler Design*. Respir Car 2005; 50(9): 1177-1188)

Without a Valved Holding Chamber, 60 – 80% of the released dose deposits in the upper airway (increasing potential for systemic absorption) and 20% passes into the lower pulmonary tract.

VHCs minimize oropharyngeal (mouth & throat) deposition by reducing the speed at which the aerosol is delivered and by removing larger (>5 µm) non-respirable particles.

Fine particles are typically <5 µm diameter- these are inhaled and reach the lower respiratory tract efficiently, where the drug receptors are located.
Proper use of a metered dose inhaler requires the patient to coordinate inhaling with the actuation of the device - which is not possible for canines.

Fortunately, Valved Holding Chambers are available for use with Metered Dose Inhalers to facilitate delivery to canines.

The **AeroDawg** Canine Aerosol Chamber was specifically designed for use in canines.

The chamber is manufactured by Trudell Medical International; manufacturers of the **AeroChamber** Brand of chambers for humans.
Delivery Technique

Delivery technique pertains to use of a Metered Dose Inhaler along with an **AeroDawg** Canine Aerosol Chamber.
There are a number of valved holding chambers on the market designed for human use. However, the AeroDawg* Canine Aerosol Chamber is designed specifically for use with dogs. Many of the facemasks on the human devices will not provide a good seal on dogs. Facemask seal is one of the most important elements of aerosol drug delivery. This is evident when the Flow-Vu* valve moves during inhalation. Even a minimal break in the seal around the face will result in poor delivery. (Amirav I, Newhouse MT. Review of Optimal Characteristics of Face-Masks for Valved-Holding Chambers. Pediatric Pulmonolgy 43: 268-274. 2008)
The exclusive Flow-Vu* Inspiratory Flow Indicator featured on the AeroDawg* Canine Aerosol Chamber moves with respiration.

- The Flow-Vu* Indicator only moves when the canine is inhaling from the AeroDawg* chamber.
- Many dogs hold their breath when the mask is first put on their face. The Flow-Vu* Indicator allows caregivers to see when the dog is inhaling.
- Breath counting is particularly important for dogs – they require more than one breath to evacuate the chamber (avg 5-6 breaths).
- The Flow-Vu* Indicator provides assurance and peace of mind to caregivers that the dog is receiving the medication.
Anti-static chambers help maximize aerosol suspension time and improve drug availability for dogs since they tend to have lower tidal volumes. This is particularly important with new charge sensitive HFA MDI formulations.
Dosing Recommendations for 
*Flovent*® HFA Metered Dose Inhaler (Fluticasone Proplionate) 
- 100 µg, 220 µg

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<th>Dosage</th>
<th>Notes</th>
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<td>Dogs &lt; 20kg: 1 actuation - 110 µg (125 µg Nationally) twice daily with <em>AeroDawg</em>® CAC</td>
<td>Since inhaled corticosteroids take 7 to 10 days to reach full effect, dogs who are newly diagnosed with respiratory diseases may be given oral corticosteroids at the same time <em>Flovent</em>® HFA is initiated, and over the next 2 to 3 weeks, oral drug administration may be tapered off.</td>
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<td>Dogs &gt; 20kg: 1 actuation - 220 µg (250 µg Nationally) twice daily with <em>AeroDawg</em>® CAC</td>
<td>Dogs that are currently on oral corticosteroids should be weaned off their oral medication over a 2 to 3 week period with reduced dosage by 50% once the <em>Flovent</em>® HFA treatment is started.</td>
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*Developed by Dr. Philip Padrid*

Adapted from: Philip Padrid, DVM. *Use of Inhaled Medications to Treat Respiratory Disease in Dogs and Cats*. Journal of the American Hospital Association 2006;42:165-169
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<td>• Albuterol Metered Dose Inhaler</td>
<td>• If required, use once daily prior to administering Flovent® HFA or as needed for acute coughing and wheezing</td>
<td>• Provides rapid relaxation of bronchoconstriction (usually within 1 to 5 minutes)</td>
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<td>• Available through different manufacturers (eg. Ventolin®, Proventil®)</td>
<td>• In emergencies, albuterol can often be used q 30 minutes for up to 4 to 6 hours without serious side effects</td>
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<td>• Single uniform strength - 90 µg/actuation</td>
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Helping dogs around the world breathe easier

www.aerodawg.com

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