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Dogs and cats presenting with signs consistent of chronic bronchitis and asthma require some diagnostic testing to confirm the diagnosis, rule out other disorders, and direct therapy. If a cat presents in a respiratory crisis caused by bronchospasm, diagnostic testing to confirm the diagnosis should be postponed till after the cat has been stabilized.

Physical examination
On auscultation, wheezes may be heard indicating narrowing of small airways, sometimes crackles are ausculted representing the sound of small airways snapping open and closing.

Blood tests
Most of these patients deserve a basic clinical workup including a complete blood count, chemistry panel, urinalysis, and heartworm testing. The intent is to determine the presence of organic or systemic disease that may be contributing to chronic cough. Testing for Feline Leukemia Virus and Feline Immunodeficiency Virus may be indicated.

Radiographs
Thoracic radiographs are vital in evaluation of small animals with bronchial disease. Typically, radiographs are normal or have a peribronchial pattern. The lungs may be hyperinflated, evidenced by a flattened diaphragm and an increased distance between the caudal border of the heart and the diaphragm. Although atelectasis can occur because of occlusion of small airways in cats with asthma, the finding of alveolar disease should prompt consideration of other disorders such as bronchopneumonia, neoplasia, or congestive heart failure.Bronchiectasis can be evident as a cylindrical dilation of bronchi as they extend to the periphery of the lung lobes, rather than their usual tapering. Masses may be evident in lung lobes or compressing the airways. Radio-opaque foreign bodies may be seen. Lastly, intraluminal masses, abscesses, parasitic nodules or foreign bodies may be outlined by the negative contrast of air in the major airways.

Fecal flotation for parasites
In areas where lungworms are endemic, a Baermann preparation should be performed to detect the presence of lungworm larvae in the stool. It must be remembered that lungworm larvae may not be present in the stool, as their numbers may be low or they may be intermittently shed. Usually fecal samples are evaluated three days in a row, and if there is a strong suspicion of the presence of lungworms, anthelminthic therapy may be initiated even if the results are negative.

Cultures and respiratory cytology
When a bronchoscope is not available, diagnostic samples may be obtained by endotracheal washing. Because of the inherent risks associated with anesthesia and increased tracheal and bronchial inflammation, this technique should be used cautiously in cats with feline asthma. When available, bacterial and fungal cultures from the airway may be diagnostic if bronchopneumonia or bronchiectasis is present, but should not be over-interpreted in the presence of chronic bronchitis. Although positive bacterial cultures are obtained in some patients with chronic airway disease, the bacteria may be colonizing the inflamed airway rather than primary pathogenic agents. Cytologic samples may show evidence of toxoplasma tachyzoites, fungal yeast forms, or lungworm larvae, and they occasionally reveal neoplastic cells. The type of inflammatory cell can also provide useful information, for example the presence of a predominant population of eosinophils in tracheal wash fluid.

Other
Congestive heart failure is a common cause of chronic coughing in dogs, but is unlikely to cause coughing in cats. However, congestive heart failure is a common cause of dyspnea in cats, and is therefore an important differential for feline asthma. Heart disease may require evaluation with echocardiography and electrocardiography.

EMERGENCY STABILIZATION
Cats that present with severe dyspnea associated with bronchospasm require aggressive but careful management. They should be immediately placed in an oxygen cage, and manipulated as little as possible to minimize stress, maximize oxygen delivery, and minimize oxygen consumption. Observation of the cat while it is resting in oxygen allows determination of the respiratory pattern. Classically, cats with asthma have expiratory dyspnea with increased abdominal effort on exhalation. Clinically, however, almost any respiratory pattern may be recognised.
**DRUG THERAPY**

There are three main therapeutic aims. First, bronchodilation must be achieved. Secondly, the inflammation that is the underlying cause of the bronchoconstriction must be addressed. Finally, cough suppressants may be required, particularly in dogs with chronic bronchitis. It is important that drugs not be given orally to the dyspneic patient.

The goal of therapy is to manage clinical signs and minimize the rate of progression of the disease. The client should be educated that these are longterm diseases that will need to be managed for the life of the pet. Typically, a trial and error approach is necessary to discover the best combination of drug therapies for each individual patient.

**Bronchodilators**

Bronchodilators are indicated for management of dogs with chronic bronchitis and bronchiectasis, and for cats with feline asthma. Two classes of bronchodilators are widely used: methylxanthine derivatives and beta 2 agonists. Methylxanthine derivatives such as aminophylline (4-5.5 mg/kg PO TID) and theophylline (dog 9 mg/kg PO BID-QID; cat 4 mg/kg PO BID-TID; extended release 20 mg/kg q24-48 hrs) are well absorbed from the gastrointestinal tract. These are phosphodiesterase inhibitors that cause bronchodilation by decreasing the intracellular breakdown of cAMP. Recent studies suggest that they may also act at the level of the diaphragm to increase its contractility and to render it less susceptible to fatigue. Thus, these agents may also prove useful in cases of chronic respiratory tract disease for reasons other than bronchodilation. The beta 2 agonists such as terbutaline sulfate (1.25-5 mg PO BID-TID) and albuterol (50 mg/kg PO BID-TID) activate adenylate cyclase and therefore they also induce bronchodilation by increasing intracellular cAMP. For many patients, the beta 2 agonists provide a more effective degree of bronchodilation than phosphodiesterase inhibitors.

For cats presenting in an asthmatic crisis, we have found that the beta 2 agonists, particularly terbutaline (0.01 mg/kg IV or IM) are particularly helpful in management. Other bronchodilators such as aminophylline can be used intravenously, but are often less effective and must be diluted in large volumes for parenteral administration. In cats with agonal respiration that fail to respond to terbutaline, epinephrine (0.5-0.75 ml of a 1:10,000 solution can be given IM or SQ) can be used in an aggressive attempt to achieve bronchodilation by its ß 2 effects.

Before administration of a bronchodilator, the cat should be carefully evaluated to confirm that there is no evidence of heart disease. Parenteral administration of a beta agonist to a cat with hypertrophic cardiomyopathy could result in worsening of dyspnea and tachycardia, with progression of congestive heart failure. If a murmur or gallop rhythm is detected on physical examination, then this category of drugs should be avoided, and instead corticosteroids become the most important therapeutic modality.

Bronchodilators are an important part of long term therapy, especially if corticosteroids are contraindicated or if the disease is not responding to steroids alone. Recognizing that inflammation is the underlying cause of bronchospasm, it is recommended that cats should not receive bronchodilators alone (without corticosteroids) for asthma therapy.

**Corticosteroids**

Corticosteroids play an important role in therapy, but considering their negative side-effects, their use should be undertaken with caution. Anti-inflammatory doses of prednisone can be beneficial for treatment of bronchial inflammation in both dogs and cats. This dose can be effective in decreasing the inflammatory response, leading to reduction of secretions, and decreases in mucosal edema, airway thickening and bronchospasm. This results in clinical improvement in many patients, with decreased coughing and better exercise tolerance. Corticosteroids may be less effective in dogs with bronchiectasis because of the risk of secondary infections in these patients.

At the beginning of treatment, most clinicians begin with a fairly high dose (Prednisone 1-2 mg/kg PO BID), and rapidly taper to a low maintenance dose. Dogs and cats should be maintained on the minimum dose that controls their clinical signs of disease, i.e. minimizes clinical evidence of coughing. Some animals can gradually be completely weaned from steroids, with resumption of therapy when their disease recurs, while others require life-long therapy to control clinical signs. If the owner has difficulty administering pills, inhaled steroids or repository steroid administration can be considered.

For cats with dyspnea caused by feline asthma, anti-inflammatory to immunosuppressive doses of short-acting corticosteroids should also be administered to counteract the underlying inflammation that is resulting in bronchoconstriction. Dexamethasone sodium phosphate (0.2-1 mg/kg IV or IM) is our drug of choice because of its low cost and easy availability. By addressing the underlying inflammatory process, corticosteroids decrease edema, minimise mucus production, and minimise the subsequent bronchospasm. Steroids are well tolerated by most cats, and do not cause many of the unwelcome side-effects that are recognised in dogs and people. Although corticosteroids have been implicated as an acute cause of increased intravascular volume which can precipitate progression to congestive heart failure, a single dose of steroids does not seem to cause clinical problems in the dyspneic cat, and if there is concern then a low dose of furosemide can be administered concurrently.

The dose of corticosteroids is variable, depending on the condition and requirements of the individual cat.

**Antitussives**

Antitussive agents are one of the cornerstones of therapy of chronically coughing dogs. They are especially important when the cough is non-productive, and are often of considerable benefit when longterm coughing is interfering with the patient’s ability to exercise and even to sleep. In such cases, the continued airway irritation caused by coughing can lead to more coughing, and thus can perpetuate a vicious cycle, which can be temporarily broken by anti-tussive agents.

The primary drugs effective as antitussives are centrally acting opiate derivatives, which act on the cough center of the brain to depress its response to cough stimuli. Hydrocodone bitartrate (1.25-5 mg PO up to QID) is effective...
Aerosolization of drugs

Bronchodilators (albuterol) and corticosteroids (fluticasone) are both available as inhalers which can be administered on a long-term basis at home to chronically coughing dogs and cats. The advantages of inhaled therapy are the administration of drugs locally to the respiratory tract, with minimal systemic absorption and therefore minimal toxicity. Possible disadvantages include insufficient distribution to the most diseased areas of the lung, and increased cost and labor intensity to the client. Administration involves the use of a face-mask and a spacer into which the drugs are aerosolized.

Drugs may not effectively be distributed to all parts of the lower respiratory tract if the patient is dyspneic, and the mask may not be tolerated by animals that are having difficulty breathing in the midst of a respiratory crisis. Thus, in an emergency aerosol administration should not be used instead of parenteral drug therapy, but rather as an adjunct in addition to parenteral drugs.

If there is concern about possible cardiomyopathy in cats, inhaled albuterol may be a good option for bronchodilation that avoids systemic drug levels. Similarly, aerosolization of fluticasone may represent a good option if corticosteroids are contraindicated, eg in a diabetic cat.

References available from the author on request

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