

# Diagnosis of respiratory disease

*Caroline Beckett RVN, Senior Veterinary Nurse in the UCD Veterinary Hospital Small Animal Medicine section, discusses the techniques used to diagnose upper and lower respiratory disease, in particular bronchoalveolar lavage, bronchoscopy, transtracheal wash and diagnostic imaging techniques*

Coughing animals commonly present in practice with the following clinical signs: dull mental attitude, anorexia, exercise intolerance, increased respiration rate, increased respiratory effort, mouth breathing and cyanosis. These signs are exacerbated as the condition progresses. First it must be decided if the cough or respiratory distress is due to inflammation, infection, parasites, obstruction, aspiration or another disease process, such as cardiac disease or brachycephalic upper airway syndrome. Animals presenting with a cough can be divided into two groups: those with upper respiratory tract issues – ie. affecting the nasal cavities, mouth, larynx, pharynx and trachea – or those with lower respiratory tract problems affecting the bronchi and bronchioles. Once you have categorised the patient, you can progress to diagnosis of the cause by an appropriate technique or combination of techniques.

## UPPER AIRWAY EXAMINATION

This allows visual assessment of the mouth, larynx and pharynx. The patient should be pre-oxygenated as intubation is delayed. Certain anaesthetic drugs will affect laryngeal function so care must be taken when choosing a protocol. Pre-medicants such as acepromazine, combined with butorphanol or methadone, may be used. Propofol is then given to effect, to induce light anaesthesia and allow visualisation of the airway and assess laryngeal movements in relation to respiration. Abnormalities include elongated, thickened soft palate and tonsillitis along with masses and foreign bodies. Brachycephalic airway syndrome patients present with elongated palates which may also be associated with stenotic nares, everted laryngeal sacs and laryngeal collapse.

## DIAGNOSTIC IMAGING

Diagnostic imaging is useful for identification of interstitial patterns, foreign bodies, torsioned lung lobes, collapsing trachea, thoracic effusion, pneumothorax and metastatic masses. In some cases, computed tomography (CT) can aid in diagnosis where x-ray fails to provide enough fine detail. Examples include airway masses, foreign bodies and aspergillosis. This is a fungal infection of the nares which can destroy the structure of the nasal turbinates and cause nasal discharge and depigmentation of the affected nasal cavity (Figure 1).

## METHODS OF OBTAINING CYTOLOGY AND BACTERIAL CULTURE SAMPLES FROM THE AIRWAY

Bronchoscopy is performed using a narrow diameter endoscope. The animal is placed in sternal recumbency

and the endoscope is introduced into the trachea via a sterile endotracheal tube (ET). Care must be taken to ensure that the ET tube diameter is large enough to allow not only introduction of the scope into the trachea, but also large enough that oxygen, gaseous anaesthetic agents and expired gases can pass in and out alongside the endoscope. In miniature breeds or cats where the ET tube is too small to allow this, total intravenous anaesthesia by means of agents such as propofol is used, and oxygen is supplied via a feeding tube attached by the ET connector to the breathing circuit when the patient is breathing spontaneously, or by use of a jet ventilator if the patient is not breathing. The patient should be monitored closely for signs of hypoxia and bradycardia during bronchoscopy and treated accordingly.

The endoscope is then passed down the bronchi and into the bronchioles and each lung lobe is assessed in standard order, starting with the right main stem bronchus, to ensure the entire airway is visualised.

If a particular area of interest is identified then a guided bronchoalveolar lavage (BAL) is indicated. This is the

## EQUIPMENT

- Mouth gag
- Adapter for ET tube to allow gas anaesthesia during endoscopy
- Sterile ET tube
- Sterile BAL tube of appropriate length and width
- 100ml bag of sterile saline
- 2 x 2-20ml syringe (depending on patient size)
- 2 x sterile hypodermic needle (any size)
- 1 x sterile plain tube (sample for bacterial culture and sensitivity)
- 1 x EDTA tube (sample for cytology)
- 1 x pair sterile gloves
- Mucus trap

## METHOD

- In a sterile manner fill two syringes of appropriate size with sterile saline
- GA patient and intubate with a sterile ET tube
- With sterile gloves introduce the BAL tube through the sterile ET tube until gentle pressure indicates that the tube has lodged in a smaller airway
- Introduce 5-20ml of sterile saline depending on patient size via the BAL tube
- Perform coupage on the thorax
- The saline can now be suctioned using a syringe or a mucus trap ensuring that negative pressure is not applied as this can collapse the airway
- Once obtained the fluid should be divided between the plain tube for bacteriology and EDTA tube for cytology
- The procedure can be repeated to obtain a diagnostic sample
- A minimum of 50% of the saline should be recovered

Table 1: BAL equipment and methods.



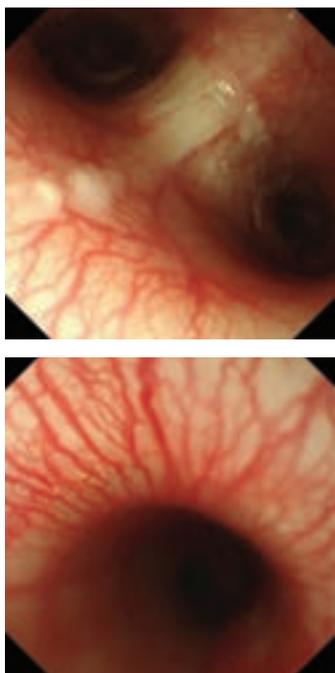
**Figure 1: Radiograph showing diffuse interstitial lung pattern. Photo: UCDVH.**

procedure of placing a sterile narrow tube with a lumen down the biopsy channel of the endoscope until just past the end of the endoscope. Sterile saline is then introduced via the tube, coupage is performed and the saline then suctioned via a mucus trap into a sterile tube to obtain samples of the cells and bacteria from the area suspended in the saline. The appropriate amount of sterile saline introduced varies depending on patient size: 5ml for cats, 10ml for small dogs and 20ml in dogs over 10kg. The appearance of the mucosa is noted in terms of normal colour, texture, shape, width, presence of mucus, blood and purulent discharge.

When bronchoscopy is not available or possible, a 'blind BAL' can be carried out.

### TRANSTRACHEAL WASH

This procedure can be useful to obtain similar samples



**Figure 2: View of carina and bronchus of dog with excess mucus and inflammation. Photo: UCDVH.**

to those obtained during BAL or bronchoscopy in patients that are too compromised to allow a general anaesthetic. Sedation may be necessary in fractious patients, however transtracheal wash (TTW) can commonly be performed with just the use of local anaesthetic. This method involves making a small incision between the tracheal rings and inserting the BAL sampling tube via a 14g catheter. The BAL tube should be pre-measured to the level of the fourth rib. Carry out wash and sample collection as for BAL. Once complete, apply a small dressing to the incision site. The patient will require supplemental oxygen via a face mask during the procedure and recovery.

### COMMON CYTOLOGICAL FINDINGS OF BAL/TTW

Neutrophils are seen most commonly with infection but also with inflammation and allergy. Eosinophils are also seen with allergic irritation but also with parasitic infection such as lungworm. Epithelial cells are seen as a normal finding but are also present in animals suffering from a disease process. Macrophages are normally present but are much increased in the presence of fluid accumulation on the alveoli.

### COMMON BACTERIAL FINDINGS

Healthy dogs and cats often have bacterial growth on an airway culture; such bacteria include *Escherichia coli*, *Pasteurella*, *Streptococcus*, *Staphylococcus*, *Enterobacter*, *Acinetobacter*, *Mycoplasma* and *Klebsiella*. As these are found in healthy animals it is important that their presence is not over-diagnosed, but only cases of unusually heavy growth are treated. *Bordetella bronchiseptica* can be found due to current or past infection and the animal may or may not be showing clinical signs. Those with clinical signs should be treated with antibiotics according to sensitivity results.

### OTHER TESTS

Coughing and dyspnoea can occur in dogs due to parasitic infection of *Angiostrongylus vasorum*. The larvae are ingested by the dog via contact with snails or slugs. The larvae migrate to the mesenteric lymph nodes, pass through the portal vessels and the adult worm progresses into the right ventricle and pulmonary artery. From here eggs migrate to the capillaries in the alveoli where they can then be coughed up, swallowed and then passed into the faeces and expelled.

Diagnosis is made via multiple faecal samples for modified Baermann or snap test from blood serum. Treatment comes in the form of a course of fenbendazole, liquid or granules.