How to do a BAL?

Clinical studies suggest that tests conducted on samples obtained by bronchoalveolar lavage (BAL) are more sensitive than those conducted on samples obtained by endotracheal wash and transtracheal wash. BAL yields a higher rate of detection for fungal and bacterial agents, neoplastic cells, and haemorrhage than endotracheal wash or transtracheal wash and is considered the best of the three tracheal wash methods for diagnosing interstitial and alveolar lung disease. Use of a bronchoscope enables direct visualization of affected airways; however, the need for an endoscope, endoscopic expertise, and anaesthesia is a drawback of this procedure.

Indications:

It is indicated in dogs and cats with alveolar or interstitial lung disease to help differentiate between neoplastic, infectious and inflammatory respiratory diseases.

Preparation:

The patient should be anaesthetised to enable intubation and oxygenation. Recommendations regarding positioning of the patient vary in the literature, we use sternal recumbency for most patients, occasionally lateral recumbency.

Material:

- EDTA and non-serum separator tubes
- Sterile blade
- Gloves
- sterile feeding tube length and diameter according to patient size. The tube length should be approximately the distance from the open end of the dog’s endotracheal tube to the last rib. The distal extremity of the tube should be cut to remove the side openings.
- Syringe filled with 3-20 mL of sterile saline plus 2-5 mLs of air. This is what we commonly use at the UVH, some authors suggest 25 mL per bolus per dog and 5 mL per kg in cats.

Technique:
1. The animal should be anaesthetised (gas anaesthesia and intubation). An IV catheter should be placed in order to inject more anaesthetic agent if the patient starts waking up during the procedure. Some special connectors enable you to insert the BAL tube in the ET tube without disconnecting the anaesthetic equipment.

2. Position the dog in sternal recumbency with its head raised by a support (e.g., rolled towel, saline bottle) if the pathology is diffuse. If one side is more affected than the other on radiographs, ideally a guided-BAL through a bronchoscope should be performed. If this is not available, placing the animal on the side that is more affected will increase the chances for the tube to go down that direction.

3. Insert your BAL tube observing an aseptic technique in the ET tube. Go as far as you can but do not force it down. Once the tube is wedged,

4. Connect your syringe to the tube and inject 3-5 mLs of sterile saline 0.9% for cats and small dogs and up to 20 mLs for large dogs.

5. Wait 5-10 sec, during which someone can do the coupage technique.

6. Aspirate the fluid sample with the same syringe. Usually 50 % of the volume injected is collected. While aspirating, pull out the tube from few mm or cm.

7. Distribute collected aspirate material into EDTA or non-serum separator tubes.

8. The presence of foamy material on the surface of the fluid when shaking the tube indicates that the small airways have been sampled. The foam is due to the presence of surfactant in your sample.

It can be repeated once.

A nurse should closely monitor the vital signs of patients undergoing BAL. Important parameters include heart rate, respiratory rate, and oxygen saturation measured with a pulse oximeter.

**Sample handling:**

The plain tube should be submitted for culture (bacterial and mycoplasma), ideally the animal should have been off antibiotics for at least 1 week to have representative culture. The EDTA tube should be submitted for cytology. The nucleated cell count is usually low, therefore cytospin slides are usually performed. The relative cell count is more valuable as it is independent of the variability in dilution inherent in BAL specimens.

**Normal findings:**
Small amount of mucus, few epithelial cells (1-15%), the predominant cell type is the alveolar macrophage, neutrophils and lymphocytes generally each form < 5% of the total cell population, eosinophils usually constitute less than 5% of the cell population in dogs and 5-25% in cats.

**Limitations:**

The cytology is sometimes unsuccessful if the wrong medium is used for the wash. Osmotic lyses of the cells harvested will occur when sterile water is used.

Cytology may be unsuccessful when large amount of mucus is present and no direct smears are submitted parallely to the EDTA sample.

Samples are sometimes non representative. The absence of foam in the sample usually means that the sample is acellular or contains an inadequate number of cells.

Oropharyngeal contamination is possible. The presence of a mixed population of bacteria (Simonsiella spp.), is usually a sign of oral contamination.

**Complications:**

Problems related to BAL, such as hypoxemia and hypotension, are often directly linked to general anaesthesia. The test should be avoided in patients with diffuse pulmonary disease that are not suitable for prolonged anaesthesia. Particular caution should also be used in patients with suspected reactive airway disease. These patients can benefit from pre-treatment with bronchodilator (theophylline, salbutamol). Tracheal tear due to cuff over-inflation can be a consequence of careless intubation. Finally rupture of a cavitary lesion is possible but rare.

**Suggested readings:**

King LG: *Textbook of Respiratory Disease in Dogs and Cats*. St. Louis, WB Saunders, 2004
