

Clinical pathology updates: The lungs and lower airways

Oliver Coldrick BVMS MRCVS

Cora Sommerey DrVetMed MRCVS

TORRANCE DIAMOND DIAGNOSTIC SERVICES, UNIT G, THE INNOVATION CENTRE, UNIVERSITY OF EXETER, RENNES DRIVE, EXETER. EX4 4RN

Cytology plays the central role in investigation of respiratory pathology. This article will focus on the trachea, bronchi, lower airways and lung parenchyma.

Respiratory disease may be localised on the basis of clinical signs and clinical examination. Further investigation may involve radiography, ultrasonography, endoscopy and MRI. Certain changes at this stage are occasionally pathognomonic (e.g. cannonball metastases in the lungs) but diagnosis of most respiratory disease will be achieved using cytology and microbiology.

Samples may be obtained for cytology and culture from the respiratory tract by fine needle aspiration, washing and brushing. There are numerous texts outlining the procedures for tracheal washing, bronchoalveolar lavage and fine needle aspiration and the reader is referred to an excellent discussion of sampling techniques by Mark Richer in *Veterinary Times* (6.11.2006). The choice of technique will depend on factors such as the stability of the patient, the presence of suspected focal or widespread disease and the availability of bronchoscopy.

TRACHEAL WASH (TW)

This procedure has the advantage that it can be performed in the conscious animal under local anaesthesia. Cell harvests are variable, however, and are often lower than with BAL. There is a small risk of tracheal trauma and hypoxia.

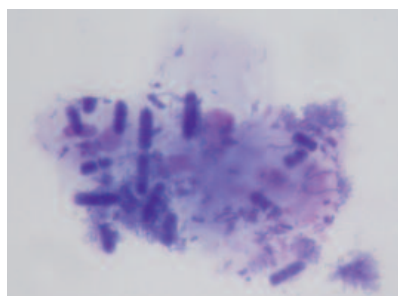
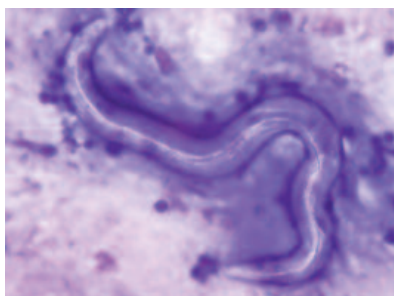


Fig. 1: (Wright's stain x 200). Raft of squames associated with mixed bacterial population and apathogenic *Simonsiella* organisms indicating oropharyngeal contamination of a BAL sample. Often, significant numbers of neutrophils will also be present, giving the false impression of inflammation.

BRONCHOALVEOLAR LAVAGE (BAL)

Performed under general anaesthesia, BAL samples are often of higher cellularity. There is less risk of oropharyngeal contamination of the sample (Fig. 1). When guided by bronchoscopy or endoscopy BALs offer the ability to target individual lung lobes. Hypoxia is the main complication of this procedure but effects may be minimised by oxygen supplementation for 5–20 mins post procedure.



Figs. 2a and b: A direct BAL smear from an 8-month-old entire male DSH cat with a history of mild dyspnoea. Radiography revealed a marked broncho-interstitial lung pattern. The fluid was of moderate cellularity containing abundant basophilic mucus and a mixed inflammatory population was observed in which activated macrophages and eosinophils predominated. Numerous lungworm larvae were present, morphology suggesting *Aelurostrongylus abstrusus*. Treatment with fenbendazole at 50mg/kg once daily for five days resulted in a full clinical recovery.

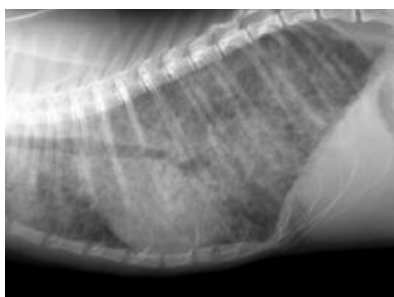


Fig. 2b.

TIPS FOR OPTIMAL SAMPLING

- Use warmed saline (to prevent bronchoconstriction)
- Use an adequate volume of saline: (Cats: TW 0.5 ml/kg; BAL 1–2 ml/kg. Dogs: TW 1 ml/kg; BAL 1–2 ml/kg. Horse: TW 30–60 ml per horse; BAL 30–250 ml per horse). These figures are guidelines. Some clinicians use higher

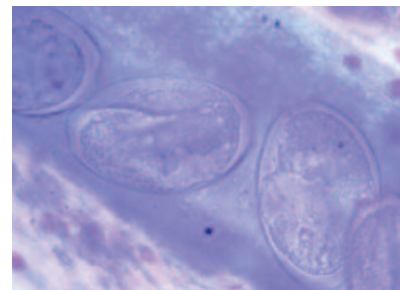


Fig. 3: (Wright's stain x 500). Section of a large adult worm present in a BAL from a 10-year-old female neutered cat with a 2 week history of coughing. There was a mixed lung pattern with a consolidated accessory lobe. The morphology of the ova suggested *Capillaria* infestation. Eosinophilic inflammation can be seen in the background. The cat was treated with fenbendazole 50 mg/kg once daily for five days and complete clinical resolution ensued. *Capillaria* is only rarely associated with respiratory disease in cats.

volumes (see Mark Richer's article in *Veterinary Times*).

- Make direct smears of mucus or spun sediment.
- Split sample – EDTA for cytology; swab or plain sample for culture. Some organisms, such as *Chlamydia*, Viruses and *Mycoplasmas* require specialist transport media.
- Avoid contact with the oropharynx as much as possible during the procedure.

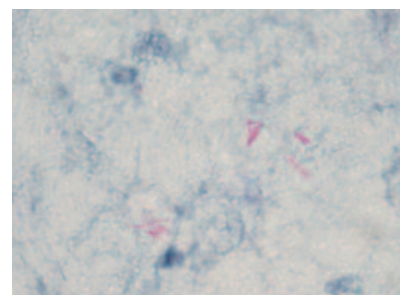


Fig. 4: (Ziehl-Nielsen Stain X1000). Bronchoalveolar lavage smear from a consolidated lung in a 1-year-old male neutered DSH cat. A Wright's stained fine needle aspirate smear (not shown) provided evidence for pyogranulomatous inflammation and numerous non-staining rod-like structures were present within macrophages. These proved to be acid fast with Zn staining. *Mycobacterium bovis* was cultured at the VLA, Weybridge, and the cat was subsequently euthanased. The VLA currently operate a free culture service in cases of suspected companion animal tuberculosis.

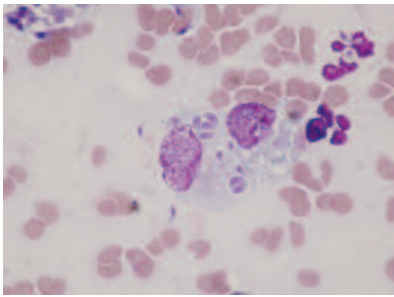


Fig. 5: (Wright's stain x 1000). Fine needle aspirate smear from a consolidated lung lobe in a 15-year-old male neutered DSH. This revealed marked pyogranulomatous inflammation. Numerous *Toxoplasma* tachyzoites were found within macrophages and neutrophils and also free in the background. These findings, coupled with the radiographic appearance, suggested granuloma formation secondary to toxoplasmosis. This patient was euthanased at the owner's request.

- As with nasal sampling, the use of brushing (e.g. bronchial brushing) can increase cell yield.
- Remember that BAL samples may not be representative where radiography suggests interstitial or focal disease.
- If you wish to repeat a BAL procedure a delay of at least 48h is recommended. Sterile saline may induce a transient neutrophilic inflammatory response.

FINE NEEDLE ASPIRATION

In the context of the lower respiratory tract

this is most applicable when there are discrete focal lesions in the lung parenchyma or imaging is suggestive of interstitial disease. Potential complications include lung laceration, pneumothorax and haemorrhage. These are minimised when the patient is

fully anaesthetised and the target lesion is close to the chest wall. Positioning the patient with the aspirated side downwards after aspiration may help to reduce the risk of pneumothorax. Prior assessment of coagulation times and a buccal mucosal bleeding time is advisable.

ACKNOWLEDGEMENT

Many thanks to Andy Torrance, Jacob Hayes and Tony Bacon.

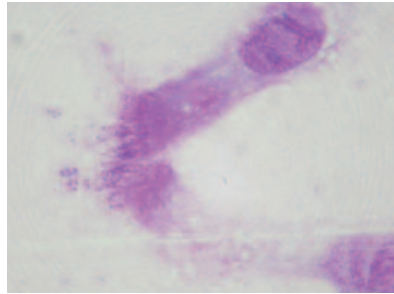


Fig. 6: (x 1000 Wright's stain). Two degenerate ciliated columnar epithelial cells in a BAL from a 3-month-old entire male CKCS with history of coughing, an interstitial lung pattern on radiography and a poor response to amoxicillin/clavulanic acid. Numerous small coccobacilli may be observed adhering to the cilia to the left of the picture. There was surprisingly little evidence for inflammation – only occasional neutrophils being found. A heavy growth of *Bordetella bronchiseptica* was cultured from the BAL fluid. Interestingly this was sensitive *in vitro* to amoxicillin/clavulanic acid. Immunodeficiency is documented in this breed and at the time of writing this patient's serum immunoglobulin levels are being assessed. Immunodeficiency could account for the persistent infection and the relative lack of a significant inflammatory response. Ciliary dyskinesia is another possible predisposing factor.

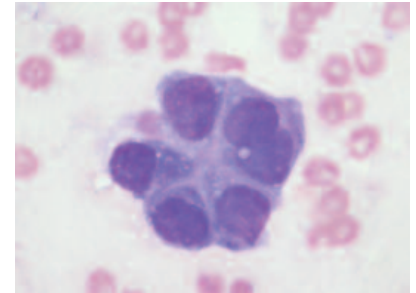


Fig. 7: (x 1000 Wright's stain). Fine needle aspirate smear from a 12-year-old female neutered Cocker Spaniel with a history of lethargy and mild cough. Radiography revealed a consolidated left caudal lung lobe. Numerous clusters and small sheets of atypical epithelial cells were present in direct fine needle aspirate smears. Several acinar structures were found, as shown above. In this case similar cell clusters were present in BAL preparations. A cytological diagnosis of adenocarcinoma was made. This patient was euthanased at the owner's request due to worsening dyspnoea.