

# Approaching the dyspnoeic cat in the middle of the night

**A logical approach to the feline patient in respiratory distress, including collection of a brief history, signalment information and performing a physical examination, will allow the clinician to localise the pathological process, writes Daria Starybrat DVM MRCVS and Simon Tappin MA VetMB CertSAM DipECVIM-CA MRCVS, Dick White Referrals, Six Mile Bottom Veterinary Specialist Centre, Cambridgeshire, UK**

## INTRODUCTION

Dyspnoea (from the Greek: *dys* meaning difficulty and *pno* meaning breath or respiration) of any origin warrants immediate veterinary assessment and attempts to alleviate compromised respiratory function. Dyspnoeic cats can be amongst the most stressful of emergency presentations (especially in the middle of the night), however, if approached in a logical and consistent manner, they can be very rewarding and satisfying cases. Treatment of respiratory distress is a true emergency, with patients (and owners) often being stressed as a result both of the underlying pathology and transportation to the clinic. This article aims to review the causes of dyspnoea and approach to the feline patient in respiratory distress including initial management, clinical examination, investigation and treatment.

## CASE PRESENTATION

It is vital to recognise the signs of dyspnoea quickly. In feline patients these might present as open-mouth breathing, tachypnoea (increased respiratory rate), orthopnoea (difficulty breathing that is relieved in sternal position), hyperpnoea (increase in depth of breaths), cyanotic or pale mucous membranes. If any of these symptoms are reported by the owner during phone triage, an emergency appointment should be strongly advised. Most of the feline patients arriving to the clinic will be distressed after the journey in the car and, since stress may exacerbate respiratory dysfunction, an initial hands-off approach to the dyspnoeic cat is usually indicated. Oxygen supplementation should be initiated simultaneously with collection of a brief, to the point history and observation of respiratory rate and effort.

Trauma patients should receive analgesia. Short-acting analgesics are preferred and opioids can be used in low doses to effect, minimising any depressive effect on the respiratory system. Methadone is commonly used at 0.2-0.3mg/kg intramuscularly (IM) or diluted and given slowly intravenously (IV) every four hours. Morphine can also be given at 0.2mg-0.4mg/kg IM or diluted slowly IV every three to four hours, however this may lead to vomiting and the clinician should be aware that rapid intravenous administration of morphine may lead to histamine release and hypotension. Buprenorphine is a partial mu agonist that can be used at doses of 0.01-0.02mg/kg IM or diluted slowly IV. Its onset of action is slower than that of other full mu agonists (15-30min) and the duration of action is longer

(six to eight hours).

Taking a brief history can allow the clinician to exclude the possibility of trauma and provide information on whether the disease process is acute in onset or chronic in nature. A previously reported cough (or unproductive attempts to cough up hairballs) might suggest asthma while history of previously diagnosed disease or ongoing treatment can help in distinguishing if we are dealing with primary or secondary respiratory compromise. The breed of the patient should also be taken into consideration when forming a list of differential diagnosis. Burmese and Siamese cats are more prone to present with chronic bronchopulmonary disease whilst Main Coons, Ragdolls and Norwegian Forest cats appear predisposed to cardiomyopathy.<sup>1,2</sup> A higher incidence of pericardio-diaphragmatic hernias has been reported in Himalayan cats.<sup>3</sup>

Observation of respiratory pattern facilitates disease localisation.<sup>4</sup> Dyspnoeic animals often adopt a body position that maximises their potential tidal volume, cats usually maintain sternal recumbency with their necks extended and elbows abducted. If any respiratory noises can be noted without the use of a stethoscope this usually suggest an extra-thoracic upper airway or tracheal abnormality, for example presence of a foreign body or a mass. Increased inspiratory effort (inspiratory dyspnoea) suggests upper airway obstruction and may also be seen with cats with laryngeal paralysis, whereas increased expiratory effort (expiratory dyspnoea) suggests increased lower airway resistance, for example with feline asthma or pulmonary oedema. Animals with pleural space disease, for example secondary to pleural effusions, have a rapid and shallow or choppy (restrictive) breathing pattern as lung compliance is reduced.

## OXYGEN SUPPLEMENTATION

There are several ways to provide the dyspnoeic patient with increased inspired oxygen. One of the easiest methods that not only allows oxygen supplementation but also minimises the need for restraint is to place the patient in an oxygen cage (see Figure 1).

There are several commercially available oxygen cages on the market that are easy to set up, maintain and store. A budget oxygen cage can be created by covering the front of a kennel with transparent plastic and running the oxygen through it. Another option is to cover a cat basket in cling wrap to contain high oxygen concentrations



**Figure 1:** An oxygen cage providing high rates of oxygen supplementation to this feline patient. Note the thermometer present to monitor for environmental hyperthermia.

around the cat. Ultimately, if possible, having a slightly bigger space for the cat to feel comfortable in, will be less confrontational and enable the cat to relax. Care must be taken to avoid development of hyperthermia in patients placed in oxygen cages as it may lead to further deterioration of clinical signs. A thermometer placed in the tent can facilitate air temperature control and, if required, cold packs or fans can be placed outside of the tent to actively cool the air inside. However helpful, oxygen tents have their limitations – they require high oxygen flows (3-10L/min depending on the tent size), delay in inspired oxygen concentration is unavoidable, control of oxygen levels can prove to be problematic if intervention or hands on monitoring is required. Moreover, prolonged oxygen supplementation should not be continued without concurrent humidification support as this could result in increased viscosity of respiratory secretions, slowed mucociliary transport, mucosal desiccation and increased risk of respiratory tract infection.<sup>5</sup> Bubble humidifiers that allow dry air to bubble through sterile water can easily resolve this problem. Alternatively, if the humidifier fitting the oxygen port is not available, regular nebulisation can be initiated. Second-hand human incubators are a more expensive option but are supplied in temperature regulators and unlike oxygen tents are at low risk of leading to patients overheating (see Figure 2).

Equipment to supply flow-by oxygen with the aid of a facemask is readily available in almost every practice, and these are suitable for initial oxygen supplementation. They require lower oxygen flows (2-3L/min) but long-term use is limited due to the need for restraint. Other methods of oxygen supplementation, such as nasal prongs or oxygen hoods, are usually poorly tolerated by feline patients. If signs of imminent respiratory arrest are noted (eg lateral recumbency, frothing at mouth, cyanosis, gasping) intubation and intermittent positive pressure ventilation (IPPV) might be necessary to provide oxygenation. The use of a fast-acting cardiovascularly sparing sedative (for example midazolam 0.1-0.3mg/kg IV or IM) might be



**Figure 2:** A feline patient within a paediatric incubator, these allow the limited interventions through the side ports without losing the contained oxygen. Care needs to be taken as the see-through nature of the incubator can be stressful to some cats.

necessary to safely secure airways but should be used with care as dyspnoeic patients present high anaesthetic risk. The oropharynx should be cleaned from fluids, blood and secretions and endotracheal tube placed with aid of a laryngoscope. Manual ventilation with 100% oxygen might decrease the risk of respiratory fatigue and subsequent cardiorespiratory arrest. Between 10 and 24 breaths per minute should be provided and chest-wall movement should be monitored during each breath.<sup>6</sup>

#### FULL CLINICAL EXAMINATION

A full clinical examination is essential, however this may not be possible immediately on presentation and the examination may need to take place in stages with an initial priority being given to the assessment of perfusion and ventilation.

Assessment of perfusion should focus on heart rate, rhythm, mucous membranes and pulse quality (femoral pulses should be assessed bilaterally). Patients with a primary respiratory condition will have regular and likely increased heart rate, with easily palpable pulses. Tachycardia with weak to absent peripheral pulses and prolonged capillary refill time suggests altered perfusion and might be a sign of shock (for example hypovolaemia) or cardiac disease. Careful fluid resuscitation with crystalloids (including boluses in the absence of cardiac disease of 5-10ml/kg of Hartmann's solution given intravenously over 15-30 minutes as required) and frequent reassessment should correct existing hypovolaemia or dehydration. The total amount of fluid administered to the patient should be recorded to avoid fluid overload as cats are less tolerant of high fluid rates. Colour of the mucous membranes might provide further information on patient's condition, with pale mucous membranes suggesting poor peripheral perfusion or possible anaemia.<sup>7</sup> Cyanosis documents a significant level of deoxygenated haemoglobin (>5g/dl) and requires immediate intervention.<sup>3</sup>

Ventilation represents the physical ability of the patient to



**Figure 3:** All four thoracic quadrants should be auscultated dorsal and ventral, cranially and caudally.

move air into and out of the lungs thus adequate ventilation is crucial in order to ensure oxygen delivery to alveoli and elimination of CO<sub>2</sub> from the tissues.<sup>8</sup> Blood gases samples measuring venous carbon dioxide levels (PvCO<sub>2</sub>) assess ventilation (not oxygenation). Normal values of PvCO<sub>2</sub> are between 40-50mmHg, with higher values documenting a respiratory acidosis through reduced ventilation.<sup>3</sup> Arterial blood gas analysis is the only accurate way to assess the oxygenation but the arterial sample is extremely difficult to obtain in feline patients especially those suffering from respiratory disorder. SpO<sub>2</sub> allows an indirect assessment of PaO<sub>2</sub> (partial oxygen pressure) as it measures blood haemoglobin saturated with oxygen. Pulse oximetry measurements of 91-100% reflect normal PaO<sub>2</sub> values of 80-100mmHg. Patient with SpO<sub>2</sub> values below 90% can be expected to be hypoxaemic and as such should be supplemented with oxygen. Following the evaluation of perfusion and ventilation the

physical examination should continue. Presence of uni- or bilateral nasal discharge and face asymmetry should be noted. When possible, palpation of the entire body should be carried out. Subcutaneous emphysema, local swelling or wounds can suggest trauma while the 'empty abdomen' raises a concern of diaphragmatic rupture.

Careful auscultation of the entire respiratory tract should be performed. It is useful to consider following questions during auscultation:

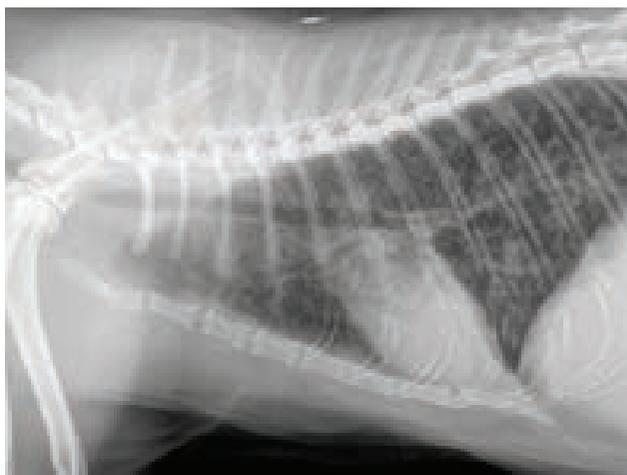
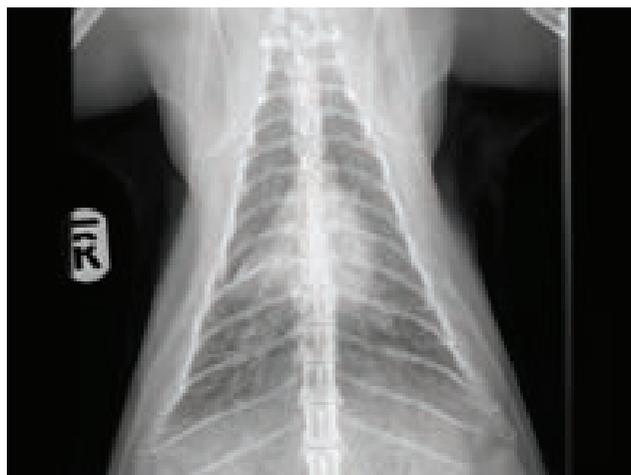
- > Does the tracheal auscultation reveal any abnormalities?
- > Do both sides of the thorax sound the same?
- > Are there any audible changes in respiratory noises?
- > Are those changes limited to one side or are they generalised?
- > Does the dorsal quadrant sound the same as ventral?

Normal vesicular lung sounds should be present bilaterally in all four quadrants (see Figure 3) of the chest but are slightly louder cranioventrally and sound like very quiet rustling of leaves and are usually slightly louder during inspiration than expiration. The presence of abnormal or adventitial noises helps to determine the cause of dyspnoea and sounds can broadly be divided into two groups – crackles and wheezes. The presence of crackles indicates alveolar disease and correlates with the alveolus snapping open and closed, suggesting possible pneumonia or pulmonary oedema. Wheezes indicate airway narrowing, such as that seen in feline lower airway disease. Heart murmur should make the clinician consider heart disease as a possible cause of the respiratory distress. Lack of lung sounds suggests pleural space disease or consolidated lung tissue.

Percussion can give further information on thoracic resonance when there is a suspicion of pleural space disease. In cats the indirect percussion method is used to assess the resonance of the thoracic organs. Right-handed clinicians will typically rest the left hand against the chest

Localisation	Observation	Auscultation	Thoracic percussion	Differential diagnosis
Upper airway disease	Increased inspiratory effort	+/- loud breathing +/- stertor +/- stridor	Normal	Nasopharyngeal polyps (young cats) Infiltrative laryngeal disease (neoplastic or granulomatous) Feline laryngeal paralysis
Lower airway disease	Increased expiratory effort	+/- wheezes	Normal	Feline asthma Chronic bronchitis
Parenchymal disease	Increased inspiratory and/or expiratory effort	+/- crackles	Normal	Pulmonary oedema (cardiogenic or non-cardiogenic) Neoplasia Contusion Pneumonia
Pleural space disease	Short and shallow respiratory pattern. Increased respiratory effort	Dull lung sounds ventrally  Dull lung sounds dorsally  Dull lung sounds ventrally, uni- or bilateral, +/- borborygmi	Hypo-resonance ventrally  Hyper-resonance dorsally  +/-Hypo-resonance ventrally, uni- or bilateral	Pleural effusion  Pneumothorax  Diaphragmatic hernia

**Table 1:** Key findings in localising the cause of feline dyspnoea.



**Figure 4:** Dorso-ventral (a) (left) and lateral (b)(right) radiographs of a five-year-old male neutered domestic shorthaired cat with marked feline lower airway disease. An obvious bronchial pattern is visible on both projections.

and use the right middle finger (bent into semi-circle) to strike the middle phalanx of the middle finger of the left hand. Low-pitched percussion tone (hypo-resonance) indicates presence of fluid whereas high-pitched tone (hyper-resonance) confirms presence of air.<sup>9</sup> Decreased compressibility of the cranial thorax might indicate a presence of a mediastinal mass, although rib spring reduces as animals get older.

### DISEASE LOCALISATION

Once the clinical examination has been performed the attempt should be made to localise the pathologic process (see Table 1):

- › Upper airway disease (less common in cats compared to dogs) manifests with increased inspiratory effort with or without loud breathing, stertor (lower-pitched 'snoring' sound) or stridor (high-pitched melodic 'wheezing' sound, associated with laryngeal paralysis);
- › Patients with lower airway disease typically present with increased expiratory effort with or without wheezes on thoracic auscultation.
- › Both inspiratory and expiratory effort can be increased in cases of parenchymal disease and crackles can be picked up on thoracic auscultation;<sup>4</sup>
- › Cats affected by pleural space disease have short and shallow respiratory pattern. Respiratory effort is increased and on auscultation dull lung sounds can be heard ventrally, dorsally or unilaterally;
- › Percussion that generates hyper-resonance in dorsal part of the thorax combined with dull or absent lung sounds heard over the same area practically confirms presence of pneumothorax. Hypo-resonance of ventral thoracic quadrant suggests presence of pleural effusion.

It is important to remember that there are also certain factors, not respiratory in origin, that can intensify or generate respiratory distress. Pain, stress or excitement, fever or hyperthermia, metabolic acidosis, anaemia, central nervous system disease, and obesity can all affect the respiratory pattern.



**Figure 5:** A brief echocardiogram can help to assess cardiac function. Assessment of the aortic and left atrial diameter can be measured in the right parasternal short-axis view. A left atrium: aortic ratio > 1.5 is very suggestive of congestive heart failure.

### DIAGNOSTIC PROCEDURES

However helpful in establishing the diagnosis, thoracic radiographs should be delayed until the patient is stable and can be safely sedated (see Figure 4).

A brief thoracic ultrasound is much more beneficial in emergency situations as many patients will tolerate a quick thoracic scan in sternal recumbency (or the position they adopted) long enough to confirm existing pneumothorax or pleural effusion. The comet-tail artefact that forms at fluid: air interface can facilitate identification of free air trapped within the pleural space. Ultrasonography can confirm presence even of very small amount of pleural effusion if transducer is placed over the area filled with fluid or over the most dependent portion of thorax. The fluid will appear as hypoechoic (black) and although the nature of the fluid cannot be determined based on sonographic appearance highly echogenic fluid can raise a suspicion of fluid rich in cells or proteins.<sup>10</sup>

Whenever possible, a blood sample should be collected



**Figure 6:** A salbutamol inhaler with a specific feline spacer. Some cats will tolerate administration well, however care should be taken in the emergency situation not to create further stress; parenteral administration of bronchodilators can be used in these cases.

without distressing the patient to exclude any metabolic or systemic diseases that may affect respiration. Excluding anaemia, FeLV, FIP, and revealing evidence of acid-base imbalance or leucocytosis to suggest possible infection or inflammation can prove helpful in guiding further diagnostic and therapeutic steps.<sup>7</sup>

A working diagnosis of congestive heart failure is often made clinically with the presence of crackles, gallop rhythm, murmur and arrhythmia. Cats in heart failure are usually dyspnoeic, hypothermic and have slightly lower heart rates than expected for the situation (130-140bpm). Additionally, distention of the jugular veins can be observed. Brief echocardiography may prove to be useful in emergency situations to allow assessment of myocardial contractility, size and shape of the heart chambers and presence of pericardial effusion (see Figure 5).<sup>11</sup>

**THORACOCENTESIS**

If presence of effusion or air is suspected, thoracocentesis should be performed. The procedure has both diagnostic and therapeutic value and as such can alleviate dyspnoea

and provide valuable information about the condition affecting the patient. Some animals will require sedation and butorphanol (0.1-0.2mg/kg IV or IM) and, if necessary, midazolam (0.1-0.3mg/kg IV or IM) is often successful. The use of centesis valve, allowing collection of fluid and emptying of the syringe without the need for moving a three-way tap, may speed fluid collection and reduce movement of the needle within the thorax. If needed, 2% lidocaine can be injected but in most cases is not required and can cause some discomfort due to its acidity. If required, lidocaine can be buffered by adding one part 8.4% sodium bicarbonate to nine parts of lidocaine, neutralising its acidity thus reducing discomfort on administration.

To perform thoracocentesis the needle is inserted into 8th or 9th intercostal space making sure that the needle is cranial to the rib to avoid the neurovascular bundle lying caudally to each rib. When air is expected the needle is positioned dorsally, about two thirds of the way up the chest wall. When fluid is present, the needle is placed about one third of the way up the chest wall. Once the needle reaches the pleural space the needle should be flattened against the chest wall by angling the needle caudally and air or effusion can be removed via suction. If fluid is being aspirated a sample should be preserved for cytological evaluation (EDTA tube and smear), biochemistry (plain tube) and culture (plain tube) (see Table 2). Larger volumes of air or purulent fluid, or fluid or air which accumulates regularly, may require the placement of a chest drain.<sup>12</sup> In patients with pyothorax antimicrobial therapy should be initiated while awaiting results of cytological evaluation, culture and sensitivity of the effusion. Intravenous formulations of medications suitable for initial empiric management include penicillin G, ampicillin or amoxicillin (alone or in conjunction with metronidazole) or amoxicillin with clavulonic acid.<sup>13</sup>

**TREATMENT**

Clinical examination should enable a presumptive diagnosis to be made and in emergent situations speculative treatment given. Excluding pleural space

	Transudate	Modified Transudate	Exudate	Chyle
Gross appearance	Clear	Slightly cloudy	Often cloudy, turbid, maybe serosanguinous	Cloudy white/cream, maybe sanguinous
Specific gravity	<1.017	1.017-1.025	>1.025	>1.025
Protein content (g/l)	<25	25-50	>30	>25
Nucleated cells (mm <sup>3</sup> )	<2,500	<7,000	>7,000	1,500-10,000
Cytology	Few cells	Mainly macrophages and mesothelial cells	Reactive mesothelial cells <ul style="list-style-type: none"> <li>• septic: degenerate neutrophils, macrophages and intracellular bacteria</li> <li>• non-septic:                             <ul style="list-style-type: none"> <li>&gt; lymphocytes;</li> <li>&gt; macrophages</li> </ul> </li> <li>• carcinomatosis: malignant cells</li> </ul>	Predominately lymphocytes
Other features				Triglyceride content > plasma Cholesterol content < plasma

Table 2: Features of the possible fluid types causing feline pleural effusion.

disease, the two most common causes of dyspnoea in cats are congestive heart failure and feline lower airway disease.

In cases of pulmonary oedema secondary to congestive heart failure, furosemide should be administered at 2mg to 4mg/kg IV or IM and repeated as required every 30-60 min for a maximum of four hours. Frequency of furosemide administration should then be reduced to two or four doses per day. In some cases, where high doses of furosemide are required, a constant rate infusion may be more effective and create less electrolyte abnormalities. Diuretics should be used with caution in severely hypovolaemic patients with adventitious lung sounds. In the longer term an ACE inhibitor such as benazepril should be used to counter the activation of the renin angiotensin system caused by heart failure and diuresis. ACE inhibitors act as balanced vasodilators, reducing systemic vascular resistance improving cardiac output. Other vasodilators such as nitroglycerin ointment, positive inotropes and antiarrhythmic medications may need to be considered in some patients.

Cats with dyspnoea due to bronchoconstriction usually respond well to treatment with terbutaline (0.015mg/kg IM) or inhaled salbutamol (100mcg/cat every four to six hours or as needed to relieve bronchoconstriction) as both agents stimulate the beta-2 adrenergic receptors in bronchial smooth muscles leading to bronchodilation. Steroids may be helpful in unresponsive cases and can be administered in form of inhaled fluticasone (50-250mcg every 12 to 24 hours). Inhaled steroids can take up to seven to 10 days to reach effective levels therefore initial therapy with oral or injectable formulations might be required (see Figure 6).

Oral prednisone at 5mg per cat every 12 hours (tapered gradually) is inexpensive and effective but the administration might be challenging in certain cats (especially those that arrive in acute respiratory distress).<sup>14</sup> In these patients a single IV or IM dose of dexamethasone sodium phosphate (0.25mg/kg) is an alternative.

## CONCLUSIONS

However challenging dyspnoeic patients seem, most can be stabilised effectively if a logical approach is followed. This article is a starting point for anyone treating feline emergencies and there are many other good sources of further information listed as references, which will help approach these often very rewarding cases.

## REFERENCES

1. Gunn-Moore D. Chronic coughing in cats. Part 1: The causes of coughing. *Irish Veterinary Journal* 2003; 56(5): 272-276
2. Ferasin L. Feline myocardial disease. 1: Classification, pathophysiology and clinical presentation. *Journal of Feline Medicine and Surgery* 2009; 11(1): 3-13
3. Mathews KA. Respiratory emergencies. In: Mathews KA (ed). *Veterinary Emergency and Critical Care Manual*. 2nd ed. Lifelearn: Guelph, 2006
4. Sigrist N. Stabilisation of the emergency patient. Part 1: Airway and breathing. *The European Journal of Companion Animal Practice* 2011; 21(1): 13-21
5. Humm K. Taking the difficulty out of dyspnoea. In: 10th Emergency and Critical Care UK Annual Congress, 7th and 8th November 2013. *Vets Now* 2013; 1-9
6. Cole SG, Hughes D. CPR in small animals: a clinical practice review. Part 1. *Journal of Veterinary Emergency and Critical Care* 2002; 12(4): 261-267
7. Miller CJ. Approach to the respiratory patient. *Veterinary Clinics: Small Animal Practice* 2007; 37(5): 861-876
8. Balakrishnan A, King LG. Updates on pulmonary function testing in small animals. *Veterinary Clinics of North America: Small Animal Practice* 2014; 44(1): 1-18
9. Rijnberk A, Brom VE van den. Methods and instruments. In: Rijnberk A, Vries HV de (eds). *Medical History and Physical Examination in Companion Animals*. Kluwer Academic Publishers: Dordrecht, 1995
10. Burk RL, Feeney DA. The thorax. In: Burk RL, Feeney DA (eds). *Small Animal Radiology and Ultrasonography. A Diagnostic Atlas and Text*. 3rd ed. Elsevier: St. Louis, 2003
11. Bode E, Martinez Y. How to perform a basic

## Libeo®, a new furosemide tablet from Interchem

Libeo® is a unique 4-way break, highly palatable tablet:

- Available in both a 40mg size and a unique 10mg size for smaller patients
- Each box contains 120 tablets in blister packs, removing the need to count out hundreds of small tablets
- The 4-way break tablets allow accurate dosing and adjustment of the furosemide dose as necessary.

Talk to your Territory Manager for more information.



Interchem (Ireland) Ltd, Unit 29, Cookstown Industrial Estate, Dublin 24  
Tel: 01 451 8959 Email: info@interchem.ie Web: www.interchem.ie



- echocardiography examination. BSAVA Companion 2015; (5): 8-14
12. Murphy K. How to place chest drains. BSAVA Companion 2013; (6): 12-18
13. Barrs VR, Beatty JA. Feline pyothorax – new insight into an old problem: Part 2. Treatment recommendations and prophylaxis. The Veterinary Journal 2009; 179(2): 171-178
14. Rozanski E, Rondeau M. Respiratory pharmacotherapy in emergency and critical care medicine. Veterinary Clinics of North America: Small Animal Practice 2002; 32(5): 1073-1086

## READER QUESTIONS AND ANSWERS

### 1: WHICH OF THE FOLLOWING STATEMENTS IS CORRECT?

- A** If pleural space disease is suspected thoracocentesis should be considered above taking a lateral thoracic radiograph.
- B** Terbutaline is a poor bronchodilator in cats.
- C** A full clinical examination should always be performed on all dyspnoeic patients immediately on admission to the hospital.
- D** Furosemide should never be given to a patient until a firm diagnosis has been reached.
- E** Furosemide should be given intramuscularly as it will have a quicker action than when given intravenously.

### 2: WHICH OF THE FOLLOWING STATEMENTS IS INCORRECT?

- A** Hearing crackles on thoracic auscultation suggests alveolar disease.
- B** Inspiratory dyspnoea reflects upper airway disease.
- C** Hearing wheezing on thoracic auscultation suggests airway narrowing.
- D** Percussion will always determine the presence of pleural effusion.
- E** Expiratory dyspnoea reflects parenchymal disease.

### 3: WHICH OF THE FOLLOWING STATEMENTS ABOUT OXYGEN THERAPY IS CORRECT?

- A** Pulse oximetry is always a reliable way to assess the effect of oxygen therapy in cats.
- B** There are no contraindications to giving oxygen in emergencies.
- C** An oxygen cage at standard flow rates generates 100%-inspired oxygen within five to 10 minutes.
- D** Nasal oxygen catheters should never be used in cats.
- E** Flow by oxygen is an ineffective option to increase inspired oxygen concentrations.

### 4: WHICH OF THE FOLLOWING STATEMENTS ABOUT ANALGESIA IS CORRECT?

- A** The use of opioids should be avoided in all dyspnoeic cats.

- B** Intravenous injection of a NSAID of choice is recommended in trauma patients.
- C** Dyspnoeic cats that suffer from concurrent head trauma should not be given any analgesia until their cranial nerve deficits and mentation return to normal condition.
- D** High doses of butorphanol provide adequate levels of analgesia in cases of severe pain.
- E** Every trauma patient should receive an appropriate short-acting analgesic.

### 5: WHICH OF THE FOLLOWING STATEMENTS IS INCORRECT?

- A** Transudate is typically clear in appearance and has a low number of nucleated cells.
- B** Samples of pleural effusion should be preserved for cytological assessment, biochemistry and culture.
- C** Cytology of a chylous effusion will predominately reveal neutrophils.
- D** Presence of intracellular bacteria confirms presence of septic exudates.
- E** In-house evaluation of pleural effusion aspirated during thoracocentesis can lead to narrowing of differential diagnosis list.

### 6: WHICH OF THE FOLLOWING STATEMENTS IS CORRECT?

- A** Every patient in risk of respiratory arrest should be immediately intubated and mechanically ventilated.
- B** An intravenous catheter should be placed immediately on admission of any dyspnoeic cat in case of sudden respiratory arrest.
- C** Mechanical ventilation can be detrimental for patients with untreated pneumothorax.
- D** Cardiac arrest almost always proceeds respiratory arrest.
- E** Long-term oxygen supplementation is safe to continue with oxygen levels above 60% for several days.

ANSWERS: 1: A, 2: D, 3: B, 4: E, 5: C, 6: C