International Congress of the Italian Association of Companion Animal Veterinarians

28 - 30 May, 2010
Rimini, Italy

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SCIVAC International Congress
May 27-29, 2011 - Rimini, Italy

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Treating canine bacterial pneumonia: more than just antibiotics

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ORGANISMS CAUSING BACTERIAL PNEUMONIA IN DOGS

Variable bacterial isolates have been reported in cases of bronchopneumonia in small animals. Most dogs with bacterial pneumonia are infected with a single organism, but some may have multiple isolates. In dogs, the majority (>80%) of bacteria cultured in pneumonia are gram negative aerobic rods such as *E. coli*, *Pseudomonas*, *Klebsiella*, *Enterobacter*, *Pasteurella*, and *Bordetella bronchiseptica*. A minority of pneumonia cases culture positive for gram positive aerobic cocci such as *Enterococcus*, *Streptococcus*, and occasionally *Staphylococcus*. The incidence of anaerobic infections in dogs with bronchopneumonia is unclear, but may be up to 20%.

Except in acute, low-grade infections, representative cultures should be obtained from the respiratory tract prior to initiation of antibiotic therapy. Antimicrobial therapy should be initiated immediately after obtaining the tracheal wash for culture, and can then be fine-tuned once the result is obtained. This author has found that tracheal cultures are usually positive and useful even if the animal has received one or two doses of antibiotics.

OBTAINING CULTURES FROM THE LUNGS

To confirm the diagnosis of bacterial pneumonia, and to help direct therapy, it is important to obtain a sample from the lungs for cytology and culture. This can be important to help distinguish pneumonia from other causes of radiographic alveolar disease such as hemorrhage or neoplasia. A cytologic finding of suppurative inflammation can help confirm the diagnosis and can suggest chronicity if macrophages are found in addition to neutrophils. Cultures will subsequently confirm the presence of bacteria, and help to direct antibiotic therapy. In order to obtain samples that are free of pharyngeal contamination, techniques that by-pass the pharynx must be used to obtain the sample. Cultures may be obtained by transtracheal or endotracheal tube washes, by bronchoalveolar lavage, or by fine needle aspiration of consolidated areas of lung.

To perform an endotracheal lavage (ETL, anesthesia is induced using a short-acting injectable drug. Propofol (1-4 mg/kg) is often used, although care must be taken to avoid any periods of apnea and to monitor cardiovascular function carefully when using this drug. The animal is intubated using a sterile endotracheal tube, with the operator wearing sterile gloves and taking great care to avoid contamination by touching the oral mucosa during intubation. Once the animal has been intubated, then a sterile catheter is placed down through the endotracheal tube into the airways. Ideally, the tube should reach far enough to pass the carina, although placement is blind. Catheters commonly used include red rubber urinary or suction catheters. Increments of 5 or 10 mls of sterile saline are injected into the airway through the tube, and then aspirated back out. Typically, the yield is only 0.5-1 mls per aspirate. Aspiration can be performed using suction on the syringe used to inject the saline, or using mechanical suction devices through a mucus specimen trap.

After the wash, the animal should receive several large breaths with 100% oxygen prior to extubation. Careful monitoring should follow extubation, and oxygen supplementation should be provided during anesthesia recovery.

FIRST-LINE ANTIBIOTIC THERAPY FOR DOGS WITH PNEUMONIA

The initial antibiotic choice should provide broad-spectrum coverage for the most likely organisms, bearing in mind the possibility of polymicrobial infection. Cytologic results may assist in antibiotic choice, by documenting whether the bacterial organisms are gram positive or gram negative, rods or cocci. Rational antibiotic choices should initially provide broad spectrum coverage effective against both gram negative and positive organisms. Once culture and sensitivity results are available, a specific and narrow spectrum antibiotic can then be chosen for ongoing care.

The route of antibiotic administration for a pneumonia patient depends on the severity of illness. If the dog is systematically quite healthy, has no evidence of hypoxemia, is eating and drinking well and is active, then oral antimicrobials are appropriate. Good oral first line choices for a stable, normoxemic pneumonia patient could include:
- Amoxicillin or amoxicillin/clavulanate
- Fluoroquinolones
- Trimethoprim/sulfa

On the other hand, if the dog is anorexic, febrile or hypoxemic, then it should probably be hospitalized for administration of parenteral antibiotics, ideally intravenously. In a sick patient, it is not reasonable to rely on drug absorption from a GI tract that may have poor perfusion and low motility. When...
AIRWAY HYGIENE AND CLEARANCE OF SECRETIONS

Clearance of secretions from the airways occurs via the mucociliary escalator and cough reflex, and is delayed if the secretions are extremely viscous and tenacious. In dogs and cats with pneumonia, large amounts of viscous secretions are produced, and attempts to resolve the infection must include attention to the character of the respiratory secretions. Productive coughing must be actively encouraged, and the secretions must be maintained as liquid as possible. More than 90% of the mucus in the respiratory tract is water, so even a mild degree of dehydration leads to drying of the secretions. The most important means by which this is achieved is by parenteral fluid therapy. Unless extreme respiratory distress is present, these patients should not be allowed to become dehydrated, and diuretic use should be avoided.

The tenacity of mucus also depends on the structure of the mucopolysaccharides that it contains. N-acetylcysteine can be administered orally, and acts as a mucolytic by opening disulfide bonds, thereby decreasing the viscosity of the mucus. It can also be administered by nebulization, but it can cause bronchospasm by this route, which is usually manifested by coughing. If coughing or dyspnea occurs, the patient may be pre-treated with bronchodilators prior to nebulization. Orally administered expectorants such as ammonium bicarbonate and potassium iodide act by irritating the mucosa of the gastrointestinal tract, thereby stimulating a vagal gastropulmonary reflex that results in increased secretion by the bronchial glands. Phenolic compounds such as guaiacol, and inhaled volatile oils such as Eucalyptus oil, may directly stimulate production of increased amounts of watery mucus.

Nebulization is a technique in which tiny spherical droplets of water are generated and inhaled by the patient. The droplets then “shower out” at various levels of the respiratory tract, depending on their size, due to changes in direction of air flow, brownian motion, and gravity. Droplets greater than 10 microns reach only the upper airway and trachea. In the range of 1-10 microns, the smaller the droplet, the deeper it is able to penetrate into the respiratory tract. Droplets less than 0.5 microns reach the alveoli and are exhaled. Most ultrasonic nebulizers create droplets in the 2-5 micron range.

Once the respiratory tract secretions have been moistened and increased in volume, clearance of the material depends on normal function of the other respiratory defense mechanisms. Atelectasis predisposes to pneumonia because bacteria can be trapped and proliferate in collapsed airspaces and cannot effectively be cleared by the mucociliary escalator. In addition, animals with prolonged or recurrent atelectasis are often recumbent, and because they are weak and sometimes painful they may also have a depressed cough reflex, further impairing their ability to clear organisms and material from their Airways. In particular, the cough reflex is a vital part of recovery from serious pneumonia. The simplest method of stimulating coughing is simply to stimulate an increased tidal volume during respiration, usually by mild exercise. Dogs with pneumonia should not be allowed to lie in one place for long periods of time. The amount of exercise needed to increase the tidal volume and respiration rate is variable depending on the severity of disease. In some, simply turning the animal from one side to the other in lateral recumbency is enough. The next step may be to stand the patient for brief periods of time, then to take a few steps, gradually building strength and mobility. Mild to moderate exercise often stimulates productive coughing which should be encouraged by coupage.

Coupage is the action of firmly striking the chest wall of the patient with a cupped hand, which helps to stimulate the cough reflex and to “break up” secretions in the airways. Coupage should be performed several times daily, especially in patients that are unable to stand and move around. It is usually well tolerated, except in patients that have experienced thoracic trauma or thoracic surgery.

References available from the author on request

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