

Review of respiratory pathology for field clinicians

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Abstract

For all various production methods, bovine respiratory disease has been described as the most common, causing the greatest production loss. With the current increasing scrutiny on the prudent use of antimicrobials, a definitive diagnosis has increased in importance. In commercial cattle operations, buiatricians are rarely called to attend to individual animals with respiratory disease. More often, we are tasked with a problem in a herd or a cohort of that herd. Almost spontaneously part of that task becomes making necropsy diagnoses. Examination of the respiratory tract at necropsy includes dissection of the upper respiratory tract, thorax, and abdomen. Explanations for clinical disease are usually evident with an extensive gross dissection of the aforementioned areas. In many cases the use of diagnostic support like histopathology, microbiology and molecular diagnostics, like immunohistochemistry, may be critical to outline changes to the management of the problem.

Key words: bovine respiratory disease, lungs

Résumé

Pour l'ensemble des méthodes de production, la maladie respiratoire bovine est considérée comme la plus fréquente et celle qui cause les plus lourdes pertes de production. Dans le contexte d'une surveillance accrue pour une utilisation judicieuse des antimicrobiens, un diagnostic final gagne en importance. Dans les exploitations commerciales d'élevage, on demande rarement aux spécialistes en buiatrie de s'occuper d'animaux avec des problèmes respiratoires. Le plus souvent on nous confie des tâches au niveau du troupeau ou d'une cohorte de ce troupeau. Faire un diagnostic suite à une nécropsie devient presque spontanément une partie de cette tâche. L'examen du tractus respiratoire à la nécropsie inclut la dissection des voies respiratoires supérieures, du thorax et de l'abdomen. L'explication de la maladie clinique est souvent évidente suite à une dissection macroscopique poussée des structures précédentes. Dans plusieurs cas, l'utilisation de soutien en matière de diagnostic comme l'histopathologie, la microbiologie et le diagnostic moléculaire peut devenir essentielle pour préciser les changements dans la gestion du problème.

Use of Field Necropsies

In times past, veterinarians were called to examine and treat individual calves or sometimes cows with pneumonia.

Currently it is much more likely that we will be called to assist with respiratory disease management in a group. The need to examine clinical cases with pneumonia is still there, but additionally we must examine the dead animals which will contribute to the complete database of the herd problem. This may be especially helpful if the predominant complaint is "poor response to treatment". Currently, as we strive to use antimicrobials more prudently, monitoring those treated animals that die with a necropsy is almost a prerequisite.

Where a large number of cattle are raised, a stock attendant could be trained to conduct necropsies and take a series of images to be submitted to the herd veterinarian. Cadavers are moved to a suitable area to conduct necropsies and to assist with their ultimate removal to the recycling plant. The bovine cadaver should be placed on the left side and when images are taken, an image of the whole animal, along with the identification, are required. Postmortem autolysis can make findings very difficult to interpret, and therefore necropsies should be completed as soon as possible after death. A good external examination of the cadaver can often lead to the definitive pathology. Subsequent to that, a gross examination of the abdominal and thoracic cavity will make 60 to 70% of the final diagnosis.

Pathogens of Respiratory Tract Spread via Bloodstream

Pathogens are commonly spread to the lungs by 2 mechanisms, via the bloodstream and via the bronchial tree. There are 2 common pneumonias spread via emboli in the bloodstream that buiatricians will encounter. Subsequent to subclinical acidosis, liver abscesses often develop and some of these may leak infectious debris into the vena cava and thereby cause abscession in the lung. In a similar fashion, a septic osteomyelitis in the hoof may cause a septicemia that spreads and localizes in the internal organs, the most obvious being the lung.

A more complicated example may be the disease associated with *Histophilus somni*. The pathogenic hypothesis is that the organism spreads to the lower respiratory tract, occasionally causing a bronchopneumonia. The lung is then considered to be the source of a septicemia, often called Histophilosis, that may manifest as encephalitis, nephritis or myocarditis.

Pathogens spread via Bronchial Tree

Common bacteria that are spread via the bronchi include *Mannhaemia hemolytica*, *Mycoplasma* spp, *Pasteurella multocida*, and *Histophilus somni*. Viruses like the bovine herpes 1, bovine respiratory syncytial virus, parainfluenza 3, bovine coronavirus and various species of adenoviruses may find their way into the respiratory tract via the bronchial tree.

Verminous pneumonias, whether *Dictocaulus* spp finding their way to the lung via the lymphatic system or migrating ascarid larvae from the digestive tract occasionally occur. Without a definitive diagnosis to direct treatment, the pneumonia may be mostly intractable.

Tracheal Disease

In feedlot cattle, probably the most common condition of the upper respiratory tract is a diphtheritic membrane caused by the bovine herpes virus 1. Clinically, the animal is coughing, hyperventilating with little exercise tolerance. A clinical exam reveals the presence of a serous nasal discharge that would become purulent in 24 to 36 hours. At this time, a visual inspection of the external nares would reveal the presence of a fibrinous lining. At necropsy, the diphtheritic fibrinous membrane would extend from the nose into the deep bronchial tree. Associated with this tracheal lesion, a bronchopneumonia is often present.

In unweaned calves on range, an infectious laryngitis means the calf can often be heard to be breathing very loud before it can be visually identified. Even with extensive treatment, some calves succumb and a necropsy is indicated to confirm the diagnosis. The relative lack of tracheal and pulmonary pathology makes the diagnosis of a laryngitis definitive.

Unusual Respiratory Disease

Bovine Honkers

After a pen of resident feedlot cattle have been presented to the facility for reprocessing, a random animal may be found extremely exercise intolerant or dead. A necropsy examination may reveal a trachea that is 75% blocked with edema. Commonly called a “honker” by the stock attendants, the cause of the condition has never been completely elucidated.

Monensin Toxicosis

Cases of monensin toxicosis are usually associated with an inadvertent mix-up in the delivery of the ration supplement to the feedlot or to the cattle. Typically, sudden death, without any observed clinical evidence, is the first indication of a feeding error. Prior to that, the only warning would be that the feed intake of an entire pen would have been reduced. Within the pen, affected cattle have extreme exercise intolerance. Blood samples from these animals show a high level of troponin 1, indicative of myocardial damage. At necropsy, the pathology is all referable to heart failure, either acute or chronic. When the mortality is acute, the predominant lesion usually is excess fluid in the thorax and abdomen. If the case in the live animal has progressed and is not considered acute, hepatomegaly, mesenteric edema, and cardiomyopathy all become grossly visible.

Neoplasia of the Respiratory Tract

Bovine lymphoma may come in a variety of manifestations. Careful scrutiny of the cadaver usually exhibits more

than 1 organ affected. The lung may have local necrotic lesions that were likely initiated by metastatic emboli. Some lymphatic locations may be more affected than others. A thymic lymphoma can often mimic other forms of respiratory disease or congestive heart failure. Stock attendants will often report the presence of very visible jugular pulse in these animals.

Extreme dyspnea may be caused by a neoplastic lesion in the upper respiratory tract. To make a specific clinical diagnosis would require the use of an endoscopic exam. A squamous cell carcinoma of the soft palate has been a surprising observation when such an examination is made.

Interstitial Pneumonias

Interstitial pneumonias may be caused by 3-methylindole, other pneumotoxins, an unknown hypersensitivity or exposure to lungworm larvae. One of the most common respiratory diseases in feedlots is usually called bronchointerstitial pneumonia, usually coded as “BIP” in feedlot databases. The bronchopneumonia component characteristically has some chronicity and exists in the dependant portions of the lung. The diaphragmatic lobes are enlarged, often with rib impressions on the lung’s surface. The etiology of this condition has not been well established.

Verminous pneumonia is often obvious grossly, especially if the bronchial tree has been well opened and examined. Lungworms in the bronchial tree give us the diagnosis. An interstitial pneumonia caused by migrant ascarid larvae would be a histological diagnosis, even with ample circumstantial evidence of exposure.

Other Pulmonary Pathology

Under any circumstances, if examination of the thoracic cavity reveals a grossly enlarged lung with visible widening of the spaces between the lobules, a careful dissection of the pericardium and heart are indicated. Classical left sided heart failure (LSHF) can be confused with respiratory disease, if a careful examination of liver, mesentery and abdomen has not been completed. A change in the proportional size of the ventricles may help to rule in congestive heart failure even if no other overt lesions in the heart exist. If histological examination reveals a pulmonary fibrosis that, if severe and extensive, can overwhelm cardiac function and result in heart failure. While there is limited agreement in the exact cause of pulmonary fibrosis, it is usually associated with an incomplete recovery from a pneumonia.

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