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Respiratory Medicine



VIRAL INFECTIONS ASSOCIATED WITH PNEUMONIA

Background

Bacterial pneumonia (BP) is an acquired inflammation of the lower airways and lung parenchyma secondary to bacterial infection. In healthy dogs, BP is difficult to induce experimentally which suggests the pathogenesis is complex and involves underlying mechanisms. Possible predisposing factors for the development of BP are diseases leading to aspiration, decreased ciliary function, or immunodeficiency. However, the role of canine respiratory viruses in the development of BP and the possible connection between canine infectious respiratory disease (CIRD) and BP have not yet been fully evaluated.

Canine infectious respiratory disease, also known as infectious tracheobronchitis or kennel cough, is considered one of the most common infectious diseases in dogs worldwide. It is highly contagious and affects the larynx, trachea, bronchi, and nasal mucosa, causing acute respiratory signs which usually are self-limiting. Because of the contagious nature of CIRD, it is most prevalent in dense dog populations such as in kennels and animal shelters. Canine infectious respiratory disease has a multifactorial etiology, and several respiratory viruses as well as bacterial pathogens have been shown to contribute to the disease complex. Canine parainfluenza virus and canine adenovirus type 2 were first detected in dogs with contagious tracheobronchitis in the 1960s and have been considered the principal etiologic agents in CIRD. Canine herpesvirus also was detected in dogs with respiratory signs decades ago, but its role in CIRD remains controversial.

In addition to these pathogens, novel respiratory viruses recently have been reported. Canine respiratory coronavirus was first identified in 2003 in dogs at a shelter in the United Kingdom. Subsequently, evidence of contagious tracheobronchitis caused by canine respiratory coronavirus has been reported worldwide. Canine influenza virus was first described in a racing greyhound population in the United States in 2004, and it was later shown that canine influenza

virus is widespread in the U.S. Canine pneumovirus (CnPnV) recently was discovered in dogs with respiratory disease in the U.S., but the role of CnPnV as a causative agent in CIRD still is not fully known. Although not considered part of the CIRD complex, canine distemper virus is an important respiratory pathogen causing severe systemic disease characterized by a variety of clinical signs, including respiratory signs.

Some bacterial pathogens, such as *Bordetella bronchiseptica*, *Mycoplasma* spp., and, more recently, *Streptococcus equi* sp. *zoepidemicus*, also have been shown to contribute to the etiology of CIRD. Viral-bacterial co-infections in the respiratory tract are common in humans with community-acquired pneumonia (CAP), and epidemiologic data as well as laboratory studies support the conclusion that respiratory viruses predispose to the development of secondary bacterial infections. Viruses destroy the respiratory epithelium and facilitate bacterial adhesion, viral infection up-regulates expression of molecules that bacteria utilize as receptors, and virus-induced immunosuppression promotes secondary bacterial infection. Recent advances in molecular diagnostic techniques have greatly increased understanding of the etiology of CAP in humans. Viruses affecting the lower respiratory tract currently are recognized as causative and complicating factors in up to 40% of humans with CAP.

In dogs, BP most often is caused by opportunistic bacteria that belong to the normal oral flora. However, published studies on viral-bacterial co-infections in dogs almost exclusively describe dogs housed in dense populations, such as kennels or shelters, that are infected with respiratory viruses and bacteria belonging to the CIRD complex. Nevertheless, it is likely that respiratory viruses also are an important etiologic factor in dogs with BP caused by opportunistic bacteria in a similar manner as has been reported in humans.

Objectives

To investigate the occurrence of viral co-infections in dogs with BP and to assess demographic or clinical variables as well as disease severity associated with viral co-infections.

Procedure

Twenty household dogs with BP caused

by opportunistic bacteria and 13 dogs with chronic (more than 30 days) tracheobronchitis caused by *B. bronchiseptica* provided respiratory samples. The diagnosis of BP or chronic tracheobronchitis was confirmed by clinical and laboratory findings, diagnostic imaging, and cytologic and microbiologic analysis of bronchoalveolar lavage or transtracheal wash fluid. Canine parainfluenza virus, canine adenovirus, canine herpes virus, canine influenza virus, canine distemper virus, canine respiratory coronavirus, and canine pneumovirus, as well as *B. bronchiseptica* and *Mycoplasma* spp., were analyzed in respiratory samples using PCR assays.

Results

Canine parainfluenza virus was detected in 7 of 20 dogs and canine respiratory coronavirus in 1 of 20 dogs with BP. Respiratory viruses were not detected in dogs with *B. bronchiseptica*. There were no significant differences in clinical variables between BP dogs with and without a viral co-infection.

Author Conclusion

Respiratory viruses were found frequently in dogs with BP and may, therefore, play an important role in the etiology and pathogenesis of BP.

Inclusions

Three tables, 65 references.

Editor Annotation

In people, viral pneumonias are commonly associated with the subsequent development of bacterial pneumonia. It has been unclear if viral causes commonly underlay apparent bacterial infections in dogs. This study looked at the rate of viral co-infections in dogs. They found that while dogs with chronic *B. bronchiseptica* pneumonia rarely had associated viral infections, dogs with opportunistic infections often had concurrent viral infections, particularly parainfluenza virus. This study is important to help the clinician understand any possible co-morbidities. It may be that antiviral therapy has a great role, but this remains to be seen. (ER)

Viitanen SJ, Lappalainen A, Rajamaki MM. Co-infections with respiratory viruses in dogs with bacterial pneumonia. *J Vet Intern Med* 2015;29:544-551.