John Ellis, DVM, PhD, Diplomate ACVP & ACVM (Immunology & Virology), Western College of Veterinary Medicine, University of Saskatchewan

Chronic Cough in a Puppy

A 14-week-old male puppy presented for chronic cough.

History. At twelve weeks of age, the puppy was brought to an animal shelter. He was given a physical exam and vaccinated with a modified-live distemper-parvo-hepatitis-parainfluenza virus vaccine. The puppy was adopted 6 days later and 4 days after adoption he started coughing. The cough became more pronounced over the next few days, especially after exertion, but he remained bright and alert and did not appear to be systemically ill.

Diagnostics. Pharyngeal swabs were taken and a transtracheal wash was performed. See **Table** for results.

Diagnosis. Canine infectious tracheobronchitis

Treatment. The puppy was administered 10-day therapy with amoxicillin/clavulanic acid. He continued to cough for approximately 6 weeks before recovering.

continues

Laboratory Findings

Direct examination of pharyngeal swab: few gram + cocci

Culture results from pharyngeal swab:
- 4+ alpha *Streptococcus* species
- 4+ *Bordetella bronchiseptica*
- *Mycoplasma canis*
- *Mycoplasma spumans*

Culture results from transtracheal wash:
- 4+ *Bordetella bronchiseptica*
- *Mycoplasma canis*
- *Mycoplasma spumans*

Antibiotic sensitivity results for *Bordetella bronchiseptica:*

Sensitive:
- Amikacin
- Amoxicillin/clavulanic acid
- Ampicillin
- Chloramphenicol
- Gentamicin
- Tetracycline
- Enrofloxacin

Resistant:
- Ceftiofur
- Cephalothin
- Clindamycin
- Penicillin
- Trimethoprim/sulfa

ASK YOURSELF...

Which of the following best explains the less than optimal response to therapy in this puppy?

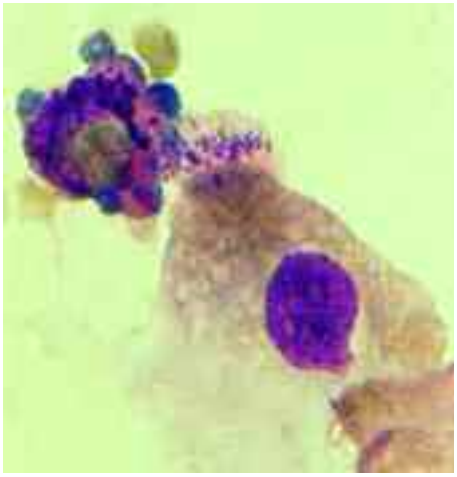
A. Many isolates of *Bordetella bronchiseptica* can become invasive and are able to survive in macrophages, making antibiotic therapy difficult.

B. *Mycoplasma* species are commensal organisms that frequently confuse laboratory findings and are most likely not clinically significant. The problem in this case was possibly either noncompliance by the owner concerning recommended treatment or development of antibiotic resistance by *Bordetella bronchiseptica*.

C. *Mycoplasma* species are generally susceptible to doxycycline and fluoroquinolones. Use of one of these drugs may have improved the clinical course in this puppy.

D. *Mycoplasma* species are generally susceptible to doxycycline and fluoroquinolones, but these drugs cannot be used in young dogs because of documented adverse effects on dental enamel formation and arthropathies that result from the use of these drugs at the recommended dose and duration of treatment.

Correct Answer: C
***Mycoplasma* species are generally susceptible to doxycycline and fluoroquinolones. Use of one of these agents may have improved the clinical course in this puppy.**



Rod-shaped bacteria typical of *Bordetella bronchiseptica* colonizing cilia of epithelial cells found in transtracheal wash.

Although *Bordetella bronchiseptica* has become synonymous with canine infectious tracheobronchitis (CITB) in many people's minds, it is important to remember that, in many cases, CITB is multifactorial. Paired serum samples can be useful in implicating coinfecting viruses such as parainfluenza virus, adenovirus, herpesvirus, and the recently recognized group 2 canine (respiratory) coronavirus or canine influenza, all of which can be difficult to isolate in many clinical settings. Basic seroepidemiology can be especially useful in outbreak situations in kennels. In many dogs with CITB, viral involvement may explain an apparently poor response to antibiotic therapy. A prolonged clinical course that does not resolve in 10 to 14 days could suggest the involvement of *Mycoplasma* species, which would be resistant to many of the antibiotics that are used to treat uncomplicated *B bronchiseptica* infections.

Another factor that may explain a poor response to antimicrobial therapy alone in CITB is the fact that much of the clinical disease is due to the host's response—inflammation—to the etiologic agents. This is certainly true in a case of *B bronchiseptica,* which does not invade beyond the mucosal surface but has many proinflammatory molecules that induce inflammation in the respiratory tract. The paroxysmal coughing and retching that is characteristic of CITB is the dog's attempt to rid the airways of the excess mucus and cellular debris that collects as a result of the inflammation.

There are several studies that document the clinical improvement obtained by using various antitussives with or without bronchodilators as adjunct therapy in CITB. While controlling the severe coughing that elicits retching is a goal of therapy to improve the animal's comfort and avert chronic changes in airways, a modicum of coughing is in fact functional and thus it should not be eliminated until the infection has cleared. However, aside from few inconclusive data concerning the use of glucocorticoids, there are currently virtually no controlled studies that have examined the use of newer antiiflammatory drugs, such as nonsteriodals, as adjunct therapy in CITB. This therapeutic approach warrants better examination in the future.

See Aids & Resources, back page, for references, contacts, and appendices.
Article archived on www.cliniciansbrief.com

THE CORRECT ANSWER EXPLAINED…

Mycoplasma species can be commensual flora in the canine oropharynx and, occasionally, in the lower respiratory tract. However, available data indicate that isolation of *Mycoplasma* species from the trachea, as opposed to the pharynx, is more likely to be clinically significant, especially if found together with *Bordetella bronchiseptica*.

Mycoplasma species are primitive bacteria that lack a cell wall. Because of their unique structure, they are resistant to many commonly used antibiotics, but often sensitive to doxycycline or fluoroquinolones. Traditionally, neither tetracyclines, such as doxycycline, nor fluoroquinolones are recommended for use in young animals because of their adverse effects on ameloblasts and developing tooth enamel and articular cartilage. Indeed, use in young, rapidly growing dogs is specifically stated as contraindicated in both label and manufacturer recommendations. These adverse effects have been documented in laboratory rodents and target species in various toxicity studies.

However, there are no reports in the literature of adverse effects in young dogs that have been treated therapeutically over short periods with clinically effective doses of either drug. The author believes therefore that doxycycline and fluoroquinolones should be reevaluated for clinical use in young dogs, especially in the case of infection with *Mycoplasma* species or other pathogens that are resistant to other antibiotics. Until such investigation has been completed, however, care should be taken with the use of fluoroquinolones for all clinical indications and they should be further reserved for life-threatening infections because of safety concerns and since resistance can develop rapidly to this class of antibiotics with indiscriminate use.

TAKE-HOME MESSAGES

- CITB is often caused by a mixed infection that can include *Mycoplasma* species.[1-4]
- Transtracheal wash is the most reliable method to implicate *Mycoplasma* species in an etiologic role in CITB.[5]
- Doxycycline can probably be used safely in young dogs at recommended doses for short periods, if culture and sensitivity indicate that it is the most appropriate antibiotic to use. Fluoroquinolones should be further investigated for such use to determine their safety since there are no documented reports of apparent toxicity in dogs to these drugs when given at recommended doses.
- Antitussive and antiinflammatory therapy in addition to judicious use of appropriate antibiotic may shorten the clinical course of CITB, and should be considered if coughing is severe and unremitting.[6]