EDUCATIONAL COMMENTARY – METHODS TO DETECT CAMPYLOBACTER IN STOOL SPECIMENS

Educational commentary is provided through our affiliation with the American Society for Clinical Pathology (ASCP). To obtain FREE CME/CMLE credits click on Earn CE Credits under Continuing Education on the left side of the screen.

LEARNING OBJECTIVES

Upon completion of this exercise, the participant should be able to

- describe three methods used to detect Campylobacter species in stool specimens.
- discuss the advantages and disadvantages of the methods used to detect Campylobacter species.

Educational Commentary

Recognized as the leading cause of bacterial gastroenteritis worldwide, the genus Campylobacter now includes at least 14 human pathogens. However, 96% to 99% of cases of gastroenteritis are caused by only two species, C jejuni and C coli. In one study, these two species comprised 80% and 16% of isolates, respectively. Other species rarely implicated in gastrointestinal disease include C hyointestinalis, C upsaliensis, and C fetus.

Campylobacter bacteria are fastidious and require a microaerobic environment for growth. Long contact with room air during stool processing can inhibit growth, and overgrowth of commensal bacteria can obscure their presence unless membrane filtration or special selective media are used. In recent years, polymerase chain reaction (PCR) assays and enzyme immunoassays (EIAs) have been developed to detect Campylobacter.

Detection Methods

Although Campylobacter was first isolated from blood in 1938, it was not isolated from feces until 1972, when Jean-Paul Butzler, MD, PhD, developed a membrane filtration technique to eliminate enteric bacteria that could obscure the Campylobacter. Subsequently, in 1977, Skirrow developed a selective medium to isolate Campylobacter. Today, there are a number of media with various combinations of antibiotics to allow growth of Campylobacter and inhibit growth of other enteric bacteria. However, some species may be missed because Campylobacter species such as C hyointestinalis, C upsaliensis, and C fetus are sensitive to the cefoperazone in some selective media and consequently will not grow.
Culture using membrane filtration can isolate the *Campylobacter* species that selective media may miss. In this method, the sample is filtered through a 45\(\mu\)m to 65\(\mu\)m cellulose filter. Facultative anaerobes and other bacteria that might obscure the *Campylobacter* are excluded, but the smaller *Campylobacter* bacteria pass through the pores of the filter. However, investigators have found that not all *Campylobacter* can pass through the filter, and the sensitivity of this method is limited to \(10^5\) colony-forming units per gram of feces.\(^2\) The results of studies comparing membrane filtration with selective media do not clearly validate the superiority of either method. Bessède and colleagues\(^1\) found that filtration detected more cases than selective media, while Kulkarni and colleagues\(^2\) found that filtration was less sensitive than selective media and concluded that membrane filtration is not appropriate for the diagnostic laboratory. Filtration is also time-consuming and tedious, and most clinical laboratories do not use this technique.

Culture is currently recognized as the gold standard method to detect *Campylobacter* in stool specimens. However, although culture is cheap and convenient, it is also time-consuming and labor-intensive; and it does not allow easy identification of *Campylobacter* to the species level. Also, studies assessing its sensitivity have produced mixed results. Some investigators have reported sensitivities as high as 94% to 95%,\(^3,4\) but others have found that the filtration and selective media methods of culture detected only 65% and 54%, respectively, of *Campylobacter* infections.\(^1\)

PCR assays can differentiate *Campylobacter* species, and results are available within one day, but this method is expensive and labor-intensive. Also, investigators have found that culture with selective media is as good as PCR for the detection of *C jejuni* and *C coli*.\(^2\) For these reasons, PCR is not recommended as a stand-alone method to detect *Campylobacter*, but some researchers have proposed that it may be useful as a screening method to determine which specimens require culture.\(^5\)

In recent years, EIAs that can detect *Campylobacter* antigens directly from stool specimens have been developed. These assays are convenient to use, provide same-day results, and eliminate the expense of the equipment and supplies needed for culture. However, studies evaluating the sensitivity of EIAs relative to culture have yielded conflicting results. Granato and colleagues\(^4\) compared three immunoassay tests with culture and found that the EIAs were more sensitive (98%-99%) than culture (94%). Conversely, a multicenter study led by investigators at the Centers for Disease Control and Prevention found that the sensitivity of EIAs varied from 74% to 84%.\(^3\) These investigators also reported a number of false-positive results, a finding that was observed by Granato and colleagues as well.

**Issues and Recommendations**

As Fitzgerald and colleagues\(^3\) note, there are no best-practice guidelines for the detection of *Campylobacter* or for interpreting and reporting discordant results between culture and nonculture tests.\(^3\)
Moreover, investigators have reported variable results for both EIA and culture; neither method has been clearly shown to be superior.\textsuperscript{1,3,4} Granato and colleagues suggest that EIAs are sufficiently reliable to replace culture as the recommended method, but Fitzgerald and colleagues disagree. Citing the lower overall sensitivity and uneven performance of EIAs in their multicenter study, they advise against using EIA as a stand-alone method to detect \textit{Campylobacter}. In particular, they recommend that laboratories confirm positive EIA results with culture.

Until the controversies in diagnostic testing for \textit{Campylobacter} are resolved and best practices are established, clinical microbiologists should be cautious in their choice of testing methods. The convenience of the newer EIAs must be balanced against possible performance issues, and testing protocols should reflect practices that will best meet the needs of the patient population.
EDUCATIONAL COMMENTARY – METHODS TO DETECT CAMPYLOBACTER IN STOOL SPECIMENS (cont.)

References and Suggested Reading


© ASCP 2011