INTRODUCTION

C. difficile is the leading cause of hospital-acquired antibiotic-associated diarrhea (AAD) and colitis. The two toxins of C. difficile are responsible for about 20% of AAD and most cases of pseudomembranous colitis. The diagnosis of C. difficile disease is based on clinical history such as antibiotic treatment, symptoms, and the presence of C. difficile toxin in fecal specimens. Bacteriological testing is the traditional method for confirming the presence of C. difficile in stool. However, this test takes 2 to 3 days and requires specific anaerobic culture equipment and media (1). A sensitive screening test, C. DIFF QUIK CHEK, reduces the labor and turnaround time by detecting glutamate dehydrogenase (GDH) (2). GDH is also called the "common antigen" because it is expressed at a high level by all C. difficile strains (3). In this study we evaluated a new membrane test, C. DIFF QUIK CHEK, by comparing it to bacterial culture. This test is a rapid membrane test using peroxidase-linked immunoglobulin for detecting C. difficile GDH in fecal specimens.

METHODS

The study protocols were approved at each site by respective institutional review boards. Information collected from the specimens were a patient age and gender in addition to the test results. The results from this study were not linked to diagnostic specimens from infants (2 years old) were included in this study because only the presence of C. difficile was tested.

Fecal specimens involved in this study were: 643 specimens sent to London Health Sciences Centre (London, Ontario, Canada); 366 samples submitted to Carilion Consolidated Laboratory (Romine, VA), Hershey Medical Center (Hershey, PA), and West Virginia University Health Sciences Center (Morgantown, WV) and tested at Techlab, Inc. (Blackburg, VA); and 86 samples were submitted to UCL Microbiology Unit (Newstead, Belgium). Age information was available for 644 patients. The distribution of the age population is shown in Figure 1. The gender was known for 351 patients (Figure 2).

All of these specimens were from AAD patients and were submitted for diagnostic testing for the presence of C. difficile and/or its toxins. All of the samples were tested using the C. DIFF QUIK CHEK test according to the manufacturer's instruction. The bacterial culture protocol was based on in-house protocols at each study site. The results are demonstrated in Table 1.

Excluding the UCL Microbiology Unit study site which uses a definitive bacterial culture method, the samples of discordant results were resolved using a research polymerase chain reaction (2) or another antibody-based commercial GDH test. The summary is presented in Table 2.

RESULTS

The C. DIFF QUIK CHEK test was comparable to the resolved bacterial culture test. Of the 978 clinical specimens, 290 tested positive by both tests and 74 were negative by both tests. Twenty-five of the 56 apparent false positive samples were positive by another GDH test, and were considered to be true positive. Thirty-one remained false positive. Ten of the 16 apparent false negative samples were negative by another GDH test, and were considered to be true negative. Six remained false negative. The resolved sensitivity, specificity, positive predictive value, negative predictive value, and the correlation were 97.8%, 98.8%, 102%, 99.2%, and 96.2% respectively (Table 2).

DISCUSSION

The C. DIFF QUIK CHEK test was comparable to bacteriological culture in this study. The high sensitivity and high negative predictive value along with a rapid turnaround time demonstrated that the C. DIFF QUIK CHEK test is a suitable rapid screening test for laboratories using the tissue culture assay or PCR for toxin genes. Using the test in a setting would eliminate approximately two-thirds of the samples in less than 30 minutes in further toxin testing, which translates into cost savings in unnecessary patient isolation and extra precaution used for patients with C. difficile disease.

In other studies, only about 55-60% of the fecal specimens positive for C. difficile common antigen were positive for toxins either by toxin ELISA or by the neutralizing tissue culture cytotoxicity assay (2). Although a GDH-positive toxin-negative result may indicate growth of nontoxigenic isolates of C. difficile in the patient, we cannot rule out the possibility that some of these specimens were true positives that contained amounts of toxin below the detection limits of the assay. Therefore, these results should alert the physician to monitor the patient closely and to perform additional testing if necessary.

CONCLUSIONS

The C. DIFF QUIK CHEK test is an excellent screening test for laboratories using bacterial culture to examine the presence of C. difficile in stool specimens. The test should be followed with toxin testing, become a positive result from the C. DIFF QUIK CHEK test does not tell if the C. difficile strain present in the sample is toxigenic or non-toxigenic.

REFERENCES


ACKNOWLEDGEMENT

We thank Carilion Consolidated Laboratory (Romine, VA), Hershey Medical Center (Hershey, PA), and West Virginia University Health Sciences Center (Morgantown, WV) for providing Techlab, Inc. with some of the AAD fecal specimens.