CORRESPONDENCE

Direct identification of *Staphylococcus aureus* from positive blood culture specimens with a rapid test

Staphylococci are some of the most common isolates from blood culture specimens and *Staphylococcus aureus* is the second most frequently isolated pathogen causing bacteraemia in our hospital [1]. Serious infections may be associated with *S. aureus* bacteraemia such as endocarditis, abscess formation and toxic shock syndrome, all in turn directly associated with increased mortality. Furthermore, some other coagulase-negative staphylococcal species are now recognised as important agents of human infection, although they also remain a cause of contamination in blood cultures. Therefore, the rapid identification of *S. aureus* directly from a blood culture is clinically relevant and is helpful in initiating appropriate antimicrobial treatment [2].

When the blood culture is positive, a direct Gram's stain is performed from the broth, and if gram-positive cocci are observed, a rapid test is necessary to distinguish *S. aureus* from other cocci (coagulase-negative staphylococci and *Micrococcus* spp.). There have been several reports of different rapid tests that have been evaluated that have shown varied sensitivity and specificity [3, 4].

RAPIDEC staphTM (bioMérieux, Marcy-l'Etoile, France) is a 2-h test for the presumptive identification of *S. aureus* directly from blood culture bottles growing gram-positive cocci [2, 5, 6]. This test detects the production of the aurease enzyme, specific for *S. aureus* strains, which is a proteolytic enzyme of coagulation that reacts with prothrombin to form a complex called staphylothrombin. The staphylothrombin then cleaves a fluorogenic peptide, releasing a peptide and a fluorescent radical which is visible under UV light. With the aim of evaluating this test in conjunction with the BacT/Alert (Organon/Teknika) continuously monitored blood culture system, it was compared with conventional tube coagulase identification.

All blood cultures that were received in the Catholic University Microbiology Laboratory over a 9-month period were analysed. In all, 5556 blood samples for culture were collected according to normal clinical criteria. These were inoculated into aerobic and anaerobic BacT/Alert bottles at the bedside and then incubated at 37°C for up to 7 days. Bottles that gave a positive signal were removed and a Gram's stain was performed. Samples with a smear showing gram-

positive cocci resembling *Staphylococcus* spp. (n = 275) were included in the study. These samples were subcultured on blood agar and chocolate agar. *Staphylococcus* spp. growing on the solid media were identified by standard laboratory methods, including the tube coagulase test.

While the samples were being cultured, the test for the detection of aurease was done according to the manufacturer's instructions. Briefly, blood culture broth (2–3 ml) and 2–3 ml of distilled water were centrifuged at 1000 g for 10 min to produce the bacterial pellet. Then 50 µl of the pellet were added to control and sample cupules. The strip was incubated at 37°C for 2 h and the fluorescent reaction was examined under UV light (365 nm). The test was scored positive when the test well was more fluorescent than the control well.

S. aureus was identified by conventional methods in 68 of these cultures. Of the remaining 207 samples, 201 were identified as coagulase-negative staphylococci and six as *Micrococcus* spp. Of the 68 blood cultures growing *S. aureus*, aurease was detected in 61 cases by the RAPIDEC staphTM test, which represents a sensitivity of 90%. Of the remaining seven samples, four were negative (two of which gave a mixed culture of both *S. aureus* and coagulase-negative staphylococci) and three tests could not be interpreted because the fluorescence did not reach the threshold of the control well (Table 1).

Among the remaining 207 samples, RAPIDEC staphTM tests were negative in 204, which represents 99% specificity; three tests gave weak fluorescence (two coagulase-negative staphylococci and a *Micrococcus* sp.). These results broadly agree with those obtained by Speers *et al.* [5], who reported 98% sensitivity and 100% specificity compared with the tube coagulase test, although they used the Vital Difco blood culture system.

Table 1. Results of RAPIDEC staphTM for the direct detection of *S. aureus* from blood cultures

Result with RAPIDEC staph TM test	Definitive identification		
	<i>S. aureus</i>	Coagulase-negative staphylococci	<i>Micrococcus</i> spp.
Positive	61	2	1
Negative	7	199	5
Total	68	201	6

The average incubation time for the growth of *S. aureus* with the BacT/Alert blood culture system in the 65 samples was 16.7 h. The RAPIDEC staphTM test takes 2 h and 15 min in total. Therefore, the results were available *c.* 19 h after obtaining the sample from the patient. The use of rapid direct tests with blood cultures has been shown to be clinically relevant, allowing antibiotic treatment to be started promptly and enabling change to a more effective therapy or to a less expensive regimen to be made if necessary [2, 7].

Although this test is not labour intensive and allows the identification of *S. aureus* 24 h earlier than conventional methods [8–10], a disadvantage is the need for skilled personnel to interpret the results. To our knowledge, this is the first report to demonstrate that the RAPIDEC staphTM test can be used successfully with the bottles of the BacT/Alert system.

False-negative results (10%) were obtained. There have been reports that such results might be due to the use of antimicrobial agents *in vivo*, to a smaller than recommended inoculum or to strains which are methicillin resistant [10]. The latter suggestion has been related to the false-negative results in the determination of coagulase by the immunological method (latex), as it is known that the methicillin-resistant strains develop a capsule which does not allow recognition by the antibody test. This would not be the case with this test because the RAPIDEC staphTM is a chemical method, which detects the presence of an enzyme.

In conclusion, the RAPIDEC staphTM test is a rapid, sensitive and specific method for direct identification of *S. aureus* from BacT/Alert blood culture bottles, and we believe that this test improves patient care either by allowing prompt commencement of appropriate therapy

or assessment of the risk of a possibly significant infection caused by coagulase-negative staphylococci.

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References

1. García P, Solari S, Montiel F. Four years with a continuously monitored blood culture system. *Rev Child Infect* 1997; **14**: 155–165.
2. Mitchell CJ, Geary C, Stevens M. Detection of *Staphylococcus aureus* in blood cultures: evaluation of a two-hour method. *Med Lab Sci* 1991; **48**: 106–109.
3. Cooke RPD, Jenkins CT. Comparison of commercial slide agglutination kits with a tube coagulase test for rapid identification of *Staphylococcus aureus* from blood culture. *J Clin Pathol* 1997; **50**: 164–166.
4. McDonald CL, Chapin K. Rapid identification of *Staphylococcus aureus* from blood culture bottles by classic 2-hour tube coagulase test. *J Clin Microbiol* 1995; **33**: 50–52.
5. Speers DJ, Olma TR, Gilbert GL. Evaluation of four methods for rapid identification of *Staphylococcus aureus* from blood cultures. *J Clin Microbiol* 1998; **36**: 1032–1034.
6. van Griethuysen A, Buiting A, Goessens W, van Keulen P, Wintermans R, Kluytmans J. Multicenter evaluation of a modified protocol for the RAPIDEC Staph system for direct identification of *Staphylococcus aureus* in blood culture. *J Clin Microbiol* 1998; **36**: 3707–3709.
7. Trenholme GM, Kaplan RL, Karakusis PH *et al.* Clinical impact of rapid identification and susceptibility testing of bacterial blood culture isolates. *J Clin Microbiol* 1989; **27**: 1342–1345.
8. Wilcox MH, Walker C, Winstanley TG, Limb DI. True identity of control *Staphylococcus aureus* strains and their performance in the tube coagulase test. *J Med Microbiol* 1996; **44**: 496–499.
9. Janda WM, Ristow K, Novak D. Evaluation of RapiDEC Staph for identification of *Staphylococcus aureus*, *Staphylococcus epidermidis*, and *Staphylococcus saprophyticus*. *J Clin Microbiol* 1994; **32**: 2056–2059.
10. Wilkerson M, McAllister S, Miller JM, Heiter BJ, Bourbeau PP. Comparison of five agglutination tests for identification of *Staphylococcus aureus*. *J Clin Microbiol* 1997; **35**: 148–151.