



Lab•O™

MICROBIOLOGY NEWS & IDEAS

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Using BD BACTEC™ Blood Culture Procedural Trays to Improve the Clinical Utility of Blood Cultures in a Multi-hospital Health System



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The isolation of viable bacteria from a patient's blood has significant clinical implications. Isolating, identifying, and susceptibility testing true pathogens is important to the successful treatment of patients with septicemia. Unfortunately, bacteria isolated from blood cultures do not always indicate infection. Contaminating microorganisms, usually gram-positive skin flora introduced during specimen collection, present the microbiologist and clinician with the difficult problem of deciding if the organism isolated is clinically relevant. Understandably physicians making this decision, when faced with uncertainty, will often initiate or continue antimicrobial therapy in the interest of patient safety. This results in the administration of unnecessary or inappropriate antibiotics, increased utilization of hospital resources, and prolonged lengths of hospital stay. These outcomes have substantial clinical and financial consequences.^{1,2}

Willis Knighton Health System consists of four hospitals operating approximately 700 beds in the Shreveport/Bossier City community. Blood cultures are collected primarily by phlebotomists

at all four sites and are transported to the central microbiology laboratory at Willis Knighton Medical Center (WKMC). On arrival blood cultures are placed in a BACTEC 9240 instrument and monitored for five days. All workups and reporting are performed at WKMC. We process approximately 22,000 blood culture sets (2 bottles/set) annually.

In 2000 Willis Knighton Health System formed an Infectious Disease Management Improvement Taskforce with the purpose of developing an outcomes-focused program to assist physicians in managing patients with infections. The medical utility of blood cultures was one of the first issues addressed. When reviewing blood culture data for January-March 2001, an unacceptably high contamination rate was detected at all four hospitals (system average 4.6%). Suspecting noncompliance with established protocols, all phlebotomists in the health system were retrained in the proper blood culture collection procedure. That protocol called for venipuncture site preparation with alcohol followed by aqueous povidone-iodine. After complete drying, blood was to be drawn by syringe and placed in BACTEC Aerobic Plus/F and

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Anaerobic Plus/F culture bottles. Following retraining, blood culture data for June-July 2001 was reviewed. In spite of retraining there was no significant decrease in contamination rate for any hospital (system average 4.4%). One site actually showed an increased contamination rate.

It was suspected that some phlebotomists were shortcutting the 2 to 3 minute drying time necessary for disinfection with aqueous povidone-iodine. Several studies have shown iodine tincture to be superior to povidone-iodine in reducing the incidence of blood culture contamination.^{2,3} Although the higher iodine concentration and the additive bactericidal activity of alcohol in iodine tincture have been suggested as reasons for this superiority, the effect of more rapid disinfection on collection procedure compliance has not been addressed.

The BD Persist™ preparation swab, a component of the BACTEC Blood Culture Procedural Tray, contains a disinfectant formulation of povidone-iodine in alcohol with a drying time requirement of only 20 to 30 seconds. The procedural trays also contain a BACTEC Aerobic Plus/F and Anaerobic Lytic/10 culture bottle set, which upon investigation was found to produce at least equivalent recovery to the Aerobic Plus/F and Anaerobic Plus/F bottle set then in use. Given these facts, along with the finding that the procedural trays were more economical to use than the existing protocol, we decided to evaluate the trays.



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Wayne Garlington is Microbiology Supervisor at Willis Knighton Health System in Shreveport, La. where he is responsible for the daily operations of the department including bacteriology, mycobacteriology, mycology and parasitology. He received his bachelor's degree in medical technology from Northeast Louisiana University and his master's degree in microbiology and immunology from Louisiana State University School of Medicine. Mr. Garlington's career as a clinical microbiologist spans 30 years. He is experienced in identifying unusual microorganisms and presenting case studies. In fact, his case study on the recovery of *Anaerobiospirillum succiniciproducens* from BACTEC blood culture bottles was featured in *LabO*, Vol. 7, No. 3 (October 1996).

Contamination Rate (%)

Hospital	Initial review	Following retraining	With procedural trays
	Jan-Mar 2001	Jun-Jul 2001	Mar-Apr 2002
WKMC	4.2	3.9	2.7
WKB	5.5	5.3	2.6
WKP	5.4	4.3	3.3
WKS	3.5	4.9	1.7
All Four Sites Combined	4.6	4.4	2.6

A trial was conducted in September-October 2001 in which the BACTEC Blood Culture Procedural Trays were used at WKMC, while no change in blood culture collection procedure was made at the other three hospitals (WKB, WKP, WKS). Review of the data from that trial showed a significant decrease in the blood culture contamination rate at WKMC to 2.1% with no decrease at the other hospitals. Based on that trial it was decided to replace the existing blood culture collection protocol used by phlebotomists with one using procedural trays at the other hospital sites also.

Following the system-wide introduction of BACTEC procedural trays in February 2002, blood culture contamination data was reviewed for March-April 2002. A synopsis of that data and the data previously mentioned are presented in the accompanying table.

Performing blood culture collections with BACTEC procedural trays utilizing Persist swabs was associated with a 40-43% reduction in blood culture contamination rates throughout all four

sites of the Willis Knighton Health System when compared to rates before and after comprehensive retraining of phlebotomists in appropriate collection procedures but using aqueous povidone-iodine and non-prepackaged collection materials. This finding is similar to the findings of other investigators.²

It is surprising and gratifying to note that WKS, which has a proportionately much larger number of pediatric blood cultures than any of the other hospitals within the health system, experienced the largest contamination rate decrease (65%) and had the lowest contamination rate (1.7%). This seems to indicate that pediatric blood culture collections should have contamination rates no higher than those associated with adult collections. There was evidence of a learning curve associated with the procedural trays since contamination rates for all four sites combined were 27% lower in April than in March of 2002. We expect rates to continue to decline to approximately 2%. In addition to decreased contamination rates, we have seen a substantial increase in the number of significant blood culture isolates, especially anaerobes. This is probably due to the more uniform collection of larger volumes of blood and the use of the BACTEC Anaerobic Lytic/10 medium.

In conclusion, incorporating BD BACTEC Blood Culture Procedural Trays containing Persist swabs in a monitored program can contribute significantly to improved clinical and financial outcomes.

¹ Bates et al. 1991. JAMA 265:365.

² Little et al. 1999. Am. J. Med. 107:119.

³ Strand et al. 1993. JAMA 269:1004.