Paper # **C-177**

Conversion to the VersaTREK® Automated Microbial Detection System from the BACTEC™ 9240 System: Retrospective Analysis of Data from Three Hospitals

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ABSTRACT (Revised)

Background: To date no publication exists for comparison of the VersaTREK (VT) 2 bottle media system with the 9240 resin media system (Becton Dickinson (BD)) regarding system performance and cost. Therefore, a retrospective analysis of blood culture data and costs from three hospitals was compared for the VT system, currently in place, with the BD system (previously used at each site).

Methods: Media used with the 9240 included Plus aerobic/F media or standard aerobic media and all sites used Lytic/10 anaerobic media and Peds/Plus media. The VT system uses a VT REDOX two bottle media set and neutralizes antibiotics through dilution. Time frames used in the analysis ranged from 9-19 months with the same calendar months analyzed for each system range. Parameters assessed in the analysis included number of sets of cultures, overall positivity rates, isolate recovery of specific organism groups, and contamination rates.

Results: Total number of blood culture sets in the study was 108,851. Overall, the positivity rate was equivalent (≤0.7% difference) for VT compared to BD. Contamination rates were comparable between the systems and varied between 0.1-0.4%. Isolate recovery of specific groups was analyzed: recovery of *S. aureus,* CNS and streptococci were higher for VT in 2 of 3 sites. All 3 sites had higher isolation of anaerobes and GNR with VT. Cost analysis demonstrated an overall savings for the VT system of 16.2% -27.1% depending on bottle volume.

Conclusion: The VT REDOX media was equivalent in 3 hospitals compared to the BD 9240, when compared to resin, standard, or lytic media. Conversion to a media system with no additional media additives provides 5 distinct benefits: 1.) equivalency in organism recovery, 2.) cost savings in laboratory media, 3.) simplicity in inventory control, 4.) ease of use with a two bottle media system, and 5.) ease in direct testing capabilities due to media without additives. In addition, hospitals converting to the VT system should recognize an average five year overall cost savings of $145,653 with annual savings range from $24K-34K.

BACKGROUND

There have been no recent publications comparing the performance of the VersaTREK Automated Microbial Detection System (VT) (TREK Diagnostic Systems, Cleveland, Ohio, USA) to the BACTEC 9240 System (BD) (Becton Dickenson, Sparks, Maryland, USA). Therefore, a three hospital retrospective study was conducted to evaluate overall positivity rates, isolation of specific pathogen groups, and contamination rates as a result of converting to VT from the BD System. The three participating sites included two hospitals from the Lifespan Hospital Organization; Rhode Island Hospital a 719 bed teaching facility, and Miriam a 247 bed community hospital. The third site, Centrex Clinical Laboratories, is a regional laboratory system that performs microbiology testing for several area hospitals with a combined 700 beds, one of which includes a regional cancer center and regional dialysis center.

One of the core differentiators between the two blood culture systems examined in this study is the detection technology. VT detects pressure changes within the headspace of the blood culture bottle from any gas produced or consumed by microorganisms; whereas the BD System utilizes a Fluorometric sensor that detects production of CO_2 by microorganisms.

METHODS

The three sites compared the number of total blood culture sets, overall positivity rates, contamination rates, and total isolate recovery of specific organisms groups (Table 2) for VT and BD. The timeframes for the analysis ranged from 9 months for the Lifespan hospitals to 19 months for Centrex. The same months of the year were evaluated for each system to rule out differences in high/low positive rates or organism types that are known to be seasonal phenomena.

The media utilized in the VT System included the VersaTREK REDOX 1 (aerobic bottle) and the VersaTREK REDOX 2 (anaerobic bottle). Media used with the BD System consisted of the Plus aerobic/F media or standard media, Peds Plus/F, and Lytic 10 anaerobic media. Blood culture workload and processing were performed per the manufacturers' recommendations. A cost comparison was also performed between the two systems.

Table: 1 Summary of Retrospective Data Examined

	Rhode Island	Miriam	Centrex
Community or Teaching Hospital	Teaching	Community	Regional Laboratory
Number of Beds	700	247	719
BACTEC aerobic/anaerobic media used prior to VersaTREK conversion	Standard/lytic	Standard/lytic	Plus aerobic/F/lytic
Number of Months (analyzed)	9 (February - October)	9 (February - October)	19 (August – February)
Total Number of Cultures– VersaTREK	19,659	10,820	30,225
Total Number of Cultures – BACTEC	15,622	9,115	23,380
Total Number of Positive Cultures – VersaTREK (positive rate)	1990 (10.12%)	1022 (9.50%)	2012 (6.70%)
Total Number of Positive Cultures – BACTEC (positive rate)	1583 (10.13%)	803 (8.80%)	1504 (6.50%)
Contamination Rate – VersaTREK	2.77%	2.93%	1.80%
Contamination Rate - BACTEC	2.29%	2.72%	1.70%

Table: 2 Number of Total Positives per Organism Group

	VersaTREK	BACTEC	VersaTREK	BACTEC	VersaTREK	BACTEC
Organism	**Rhode Island Hospital**	**Rhode Island Hospital**	**Miriam Hospital**	**Miriam Hospital**	**Centrex Hospital**	**Centrex Hospital**
S. aureus	317	349	163	109	370	300
Coagulase Negative Staph.	557	633	355	334	633	461
Streptococcus/Enterococcus sp.	167	184	86	75	252	161
Gram Positive Rods	7	23	4	1	3	2
Enterobacteriaceae	371	329	162	155	392	367
P. aeruginosa	56	40	9	15	46	29
Gram Negative - Non-Fermentors	139	48	12	10	44	24
Candida sp.	38	79	13	19	32	34
Anaerobes - Gram Positive	29	9	19	13	54	38
Anaerobes - Gram Negative	17	20	9	3	32	24

RESULTS

1. Table 1 displays the summary of retrospective data analyzed. Parameters include; type of hospital, total number of beds, media used, number of months the systems were analyzed, total number of positive cultures, positivity rate, and contamination rates for both the VT and BD systems.

2. Table 1 shows overall total positivity rates were equivalent (≤0.7% difference) for VT compared to BD. Total positivity rates for VT compared to BD at each site were 10.12% and 10.13% for Rhode Island, 9.50% and 8.80% for Miriam, and 6.70% and 6.50% for Centrex.

3. Contamination rates were comparable between the systems and varied between 0.1-0.4%. Contamination rates for VT compared to BD at each site were 2.77% and 2.29% for Rhode Island, 2.93% and 2.72% for Miriam, and 1.80% and 1.70% for Centrex.

4. Organism group comparisons are recorded in Table 2. Although certain organism groups were isolated more frequently in one system compared to the other during the timeframe studied, multiple sets per patients and episode comparisons were not included in the study. The comparison was performed to determine if notable differences in organism groups occurred between the two systems. Overall isolation was similar between the two systems. Areas of interest in Table 2 include the following:
   - The number of *S. aureus,* coagulase negative Staph, and Streptococci/Enterococcus sp. were greater for VT for Miriam Hospital and Centrex Laboratories. Whereas, at Rhode Island Hospital, staphylococcus, Streptococcus and Gram positive aerobic rods were recovered more in the BD System.
   - Gram negative rods and anaerobes were more frequently isolated in VT for all three hospitals studies compared to BD.
   - More yeast was isolated in the BD system at Rhode Island Hospital and Miriam.

5. During the 19 month study timeframe examined, Centrex Laboratories recovered 12 *Campylobacter* sp. in VT. No *Campylobacter* sp. were recovered by BD

6. A five year cost analysis based on acquisition options and media expense was performed for the two systems. The analysis demonstrated an average of 16.2-27.1% in total cost savings for VT customers after they converted from BD. This analysis equates to an average five year overall cost savings of $145,653 with an annual savings range from $24K-34K.

DISCUSSION AND CONCLUSIONS

Blood culture is one of the most important tests performed in the laboratory. Prognosis of a patient is directly dependent upon the rapid isolation and identification of the blood pathogen[1]. Currently, there are three major blood culture systems that have been cleared by the FDA. When a laboratory converts from one system to another, it is important that the new system performs better or equivalent to the previous system. One method, less labor intensive than a direct comparison study, is to perform a retrospective analysis of data comparing results of the two systems from the same time periods. While this type of study is not ideal, it does allow possible identification of obvious benefits or discrepancies.

A retrospective analysis was performed by three sites that converted to VT from the BD System. Positivity and contamination rates were included in the analysis. Over 108,000 total cultures were used in the analysis, and positive and contamination rates were compared between the two systems. Recovery of specific pathogen groups was also assessed.

This retrospective study shows VT's 2-bottle media system is equivalent to BD's multi-bottle media system. The positive and contamination rates between VT and BD were equivalent at all sites. Additional benefits realized by converting to VT include; cost savings, simplicity in inventory control, ease of use in direct testing, and minimizing phlebotomy errors and increasing clinical ease of use with a single media blood culture set for all patients.

REFERENCES

1. Weinstein, M.P., et. al, 1997, Clin. Infect. Dis. 24:584-602