Comparison of Novel Blood Culture System DL-Bt112™ with BacT/Alert 3D™

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Backgroud

Blood cultures are the main diagnostic laboratory tool to detect bloodstream infections (1). In many clinical microbiology laboratories utilize automated blood culture systems to isolate infectious agents from blood samples (1,2). The diagnostic performance and time-to-detection (TTD) values of the novel automated blood culture system, DL-Bt112™ (DL) was compared with BacT/Alert 3D™ (B3D) by using clinical samples.

Materials and Methods

Total of 356 blood culture sets (178 set for each system) were evaluated for 6 months of period in a university hospital. Two sets of blood culture samples (one for DL and one for BacT/Alert) were drawn from intensive care unit patients who were suspected to have bloodstream infections. A set was consisting of an aerobic and an anaerobic blood culture bottle. The samples were immediately sent to laboratory and loaded to respective systems. Vitek® 2 automated system (BioMerieux, Marcy-l'Étoile, France) was used for identification of the isolated bacteria. Specifications of the systems were listed in Table 1.

Table 1. Comparison of technical specifications of the DL

	BacT/Alert 120™ (B3D)	DL-Bt122™ (DL)
Principle	Growth of microbe produces CO_2, CO_2 reacts with H_2O and produces H^+. Then H^+ turns the color of bottle from blue into orange (Visualization Method)	Growth of microbe produces CO_2, CO_2 reacts with H_2O and produces H^+. Then H^+ turns the color of bottle from blue into orange (Visualization Method)
Operation System	LCD touch-pad	Linux System with touchpad
Statistics function	Available	Available
Incubation Method	Continuous swinging culture	Continuous swinging culture
Detection System	Every cell has its own detector with every 10 minute detection	Every cell has its own detector with every 10 minute detection
Antimicrobial Neutrolization	Carbon	Resin Media
Bottling	Not supported	Able to resume the procedure if a sample is picked up and reinserted within at least 2 hours.
Delayed-vial-entry capabilities	Up to 48 hours at room temperature.	Up to 48 hours at room temperature.
Bottle types	BacT/ALERT PF Plus BacT/ALERT FN Plus BacT/ALERT FA Plus BacT/ALERT SA Standard Aerobic BacT/ALERT SN Standard Anaerobic BacT/ALERT FA FAN® Aerobic BacT/ALERT FN FAN® Anaerobic BacT/ALERT PF Pediatric FAN	FAN adult anaerobic/aerobic blood culture bottle, Children's blood culture bottle
Bottle Material	Carbon fiber reinforced plastic	Multilayer polymeric fibers

Results

The number of the positive bottles, which were detected by both systems, was 47. Both systems detected 294 negative bottles. Isolates from 39 positive bottles out of 47, were interpreted as agent of blood stream infection (BSI), whereas 8 of them were agent of contamination. Overall recovery rates of the systems were 79,03% for the DL and 96,77% for B3D (Table 2). When TTD values were evaluated, B3D was significantly faster for BSI isolates (p<0,005). *K. pneumoniae* was the most common agent isolated (n=17) and B3D gave positive signals 105,6 minutes earlier than the DL in average (p<0,005) (Table 3).

Table 2. Comparison of recovered bacteria and bottle signals in the DL and BacT/Alert blood culture bottles.

		No. of isolates recovered in			*p* value
		Both Systems	**Only BacT/Alert**	**Only DL**	
Gram (-)	*K. pneumoniae*	17	1	0	1.0
	P. aeruginosa	2	0	0	1.0
	P. mirabilis	1	1	0	1.0
	E. cloaca	2	0	0	1.0
	E. coli	5	2	0	0.5
Gram (+)	*E. faecium*	4	0	0	1.0
	S. aureus	2	1	0	1.0
	S. epidermidis	10	2	2	1.0
	S. hominis	1	5	0	0.453
	Corynebacterium spp.	1	1	0	1.0
Fungi	*C. albicans*	2	0	0	1.0
Bottle with on antibiotic		18	8	0	**0.04**
Bottle without antibiotic		29	5	2	0.08
Positive Bottles		47	13	2	**0.007**
Negative Bottles		294	2	13	**0.007**
Recovery Rate (%)			96,77%	79,03%	

Conclusion

The recovery rate of DL was unfavorably low and time-to-detection values for DL were significantly higher than that of B3D. This might result from the ingredients of the culture bottles since the detection technologies of the systems were similar. More studies are needed to ensure the clinical use of DL besides its economical advantages.

Table 3: Comparison of time-to-detection values of the DL and BacT/Alert blood culture bottles according to types of recovered bacteria.

	DL		BactAlerT			
	mean (*min*)	lowest-highest	mean (*min*)	lowest-highest	mean difference (*min*)	*P* values
oniae (n=16)	943.6	522-1482	836.1	417-1454	107.5	**0.007**
=5)	934.6	642-1304	857.2	504-1307	77.4	0.176
(n=2)	1103.5	855-1352	921	777-1065	104.5	0.331
osa (n=2)	831	785-872	856	748-964	25	0.756
is (n=1)	1774	1774	734	734	1040	*NC*
gatives Total (n=26)	977.4	522-1774	844.3	417-1454	133.1	**0.006**
'n=2)	652	635-669	611.5	604-619	40.5	0.346
)	1575.7	684-3008	1022	691-1526	510.5	0.241
r (n=4)	990.7	941-1062	986	892-1094	1.25	0.974
sitives Total (n=10)	1157	635-3008	944.2	604-1526	212.8	0.195
s (n=2)	2946	2410-3482	2152.5	1353-2952	793.5	0.204
nations						
diphteroids (n=8)	1982	1359-2982	1648	1224-2476	413.2	**0.048**

References

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