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NOTES

Evaluation of the Autobac 1 Susceptibility Testing System in a Clinical Diagnostic Laboratory

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The Autobac 1 system was compared to the disk diffusion and agar dilution methods. Overall, there was good correlation; however, certain antibiotic/bacterial combinations gave unreliable results. In particular, unreliable results were obtained against staphylococci with penicillins, aerobic gram-negative rods with cephalothin, and enterococci with cephalothin and clindamycin.

The performance of Autobac 1 (Pfizer) was compared with the disk diffusion and agar dilution methods in a routine hospital microbiology laboratory.

Four hundred gram-negative and 300 gram-positive organisms were isolated from clinical specimens submitted to our laboratory. These were *Escherichia coli* (181), *Klebsiella* species (74), *Proteus* species (56), *Pseudomonas aeruginosa* (51), *Enterobacter* species (22), *Citrobacter* species (7), *Acinetobacter calcoaceticus* (3), *Salmonella* species (3), *Alcaligenes faecalis* (2), *Serratia marcescens* (1), *Staphylococcus aureus* (156), *Staphylococcus epidermidis* (53), *Enterococcus* (44), and beta-hemolytic streptococcus (37).

The materials and the methods used in this study were essentially those of a previously published collaborative study (4) with one important modification; i.e., in addition to the agar dilution breakpoints selected by Thornsberry et al. (4), we introduced alternative breakpoints for ampicillin, cephalothin, and kanamycin (see Table 2) based on data concerning obtainable drug concentrations in blood (1, 2, 3).

Autobac 1 and agar dilution-gram-negative bacteria. Agreement (Table 1) ranged between 57 and 98% with nine antibiotics tested against gram-negative organisms; there was over 90% agreement with five antibiotics. With each antibiotic, major and very major discrepancies were less than 5%. When the breakpoints of Thornsberry et al. (4) were applied to the agar dilution test, the agreement was only 57% with cephalothin, 74.75% with ampicillin, and 87.5% with kanamycin. However, when our breakpoints (Table 2) were applied, the agreements between results obtained with Autobac 1 and agar dilution technique changed to the following: cephalothin 79%, ampicillin 91.2%, and kanamycin 95.1% (Table 3). Thus, applying our breakpoints reduced the number of minor discrepancies without increasing the discrepancies in major and very major categories.

Autobac 1 and agar dilution-gram-positive bacteria. When the breakpoints of Thornsberry et al. (4) were used, many major discrepancies were seen (Table 3). This was particularly true of tests with penicillin G (16.66%) and ampicillin (11.66%). Thus, with respect to penicillin, 26 of 156 strains (16.6%) of *S. aureus* and 23 of 53 strains (43%) of *S. epidermidis* tested showed major discrepancies. Similarly, major discrepancies were seen with 17 of 156 (11%) strains of *S. aureus* and 15 of 53 (28%) strains of *S. epidermidis* tested with ampicillin. Minor discrepancies were common (14.66%) in the tests of cephalothin against the gram-positive group of

TABLE 1. *Comparison of agar dilution and Autobac 1 methods with 400 gram-negative bacteria*

Antibiotics	Discrepancies (%)			Agreement (%)
	Minor	Major	Very major	
Ampicillin	21	4	0.25	74.75
Cephalothin	42.5	0	0.5	57
Kanamycin	10.75	0.25	1.5	87.5
Chloramphenicol	2.5	3.5	0.5	93.5
Tetracycline	0.75	0.25	4.25	92.75
Gentamicin	0.75	0.25	1	98
Nalidixic acid[a]	1.3	0	2.6	96.1
Colistin	3.75	0.25	4	92
Carbenicillin	7	1	3.5	88.5

[a] One-hundred and fifty strains tested.

TABLE 2. *Comparison of agar dilution and Autobac 1 against 400 gram-negative bacteria with ampicillin, cephalothin, and kanamycin and 300 gram-positive bacteria with cephalothin*

Bacterial group	Antibiotics	Discrepancies (%)[a]						Agreement (%)[a]	
		Minor		Major		Very major			
		(A)	(B)	(A)	(B)	(A)	(B)	(A)	(B)
Gram-negative group	Ampicillin	21	3	4	4.7	0.2	2	74.75	91.2
	Cephalothin	42.5	20	0	0.5	0.5	0.5	57	79
	Kanamycin	10.7	1.5	0.2	2.2	1.5	1.2	87.5	95.1
Gram-positive group	Cephalothin								
	All gram-positive organisms	14.6	1	0.3	0.3	0.3	6	85	93
	All gram-positive organisms except enterococci	3.1	0.4	0.4	0.4	0.4	3.1	96.1	96.1

[a] (A), Breakpoints of Thornsberry et al: ampicillin-susceptible ≤8, intermediate 16 and 32, resistant ≥64; cephalothin-susceptible ≤8, intermediate 16 and 32, resistant ≥64; kanamycin-susceptible ≤8, intermediate 16, resistant ≥32. (B), Our own breakpoints: ampicillin-susceptible ≤8 μg/ml, resistant ≥16 μg/ml; cephalothin-susceptible ≤16 μg/ml, resistant ≥32 μg/ml; kanamycin-susceptible ≤16 μg/ml, resistant ≥32 μg/ml.

TABLE 3. *Comparison of the agar dilution and Autobac 1 methods with 300 gram-positive bacteria*

Antibiotic	Discrepancies (%)			Agreement (%)
	Minor	Major	Very major	
Penicillin	0	16.66	0.66	82.68
Cephalothin				
All organisms	14.66	0.33	0.33	84.68
All organisms except enterococci	3.1	0.4	0.4	96.1
Ampicillin	2.33	11.66	0.66	85.35
Erythromycin	0	0.33	1.33	98.34
Tetracycline	1	0.33	2.33	96.34
Clindamycin				
All organisms	1.6	1	8	89.4
All organisms except enterococci	0.4	1.1	0.4	98.1
Methicillin	0.66	1	1.33	97.0
Chloramphenicol	0.66	0.66	0	98.68

bacteria. However, the use of our breakpoints (Table 2) dropped minor discrepancies to 1%, but very major discrepancies rose from 0.3 to 6%. Discrepancies were also reduced when the results of enterococci with cephalothin and clindamycin were excluded (Tables 2 and 3).

Autobac 1 and disk diffusion-gram-negative bacteria. There was an overall correlation that ranged from 86.25 to 99.34% (Table 4). Discrepancies were most commonly associated with cephalothin and ampicillin.

Autobac 1 and disk diffusion-gram-positive bacteria. Agreement among gram-positive organisms (Table 5) ranged from 83.1 to 97.67%. Correlations improved when tests of enterococci with penicillin G, cephalothin, and clindamycin were excluded. Five percent very major discrepancies were associated with ampicillin.

TABLE 4. *Comparison of the disk diffusion and Autobac 1 methods with 400 gram-negative bacteria*

Antibiotic	Discrepancies (%)			Agreement (%)
	Minor	Major	Very major	
Ampicillin	5.75	7.75	0.25	86.25
Cephalothin	8	1.5	1.25	89.75
Kanamycin	2.75	0.25	2.25	95
Chloramphenicol	5.5	1.5	0.25	92.75
Tetracycline	4	0	0.25	95.75
Gentamicin	0.25	1.25	1	97.5
Nalidixic acid[a]	0	0	0.66	99.34
Carbenicillin	3.25	1.25	0.75	94.75
Colistin	1.75	0	0.5	97.75

[a] One-hundred and fifty strains tested.

TABLE 5. *Comparison of disk diffusion and Autobac 1 methods with 300 gram-positive bacteria*

Antibiotics	Discrepancies (%)			Agreement (%)
	Minor	Major	Very major	
Penicillin				
All organisms	14.3	1	1.6	83.1
All organisms excluding enterococci	0.1	0.03	0.03	99.84
Cephalothin				
All organisms	4.3	0.66	2.6	92.44
All organisms excluding enterococci	0.8	0.8	0.8	97.6
Ampicillin	1.6	1.6	5	91.8
Erythromycin	2	0.66	3	94.34
Tetracycline	0.66	2.6	1.6	95.14
Clindamycin				
All organisms	1	0.66	10	88.34
All organisms excluding enterococci	0.4	0.8	1.5	97.3
Chloramphenicol	1	0.33	1	97.67

There was broad general agreement between our results and those of Thornsberry et al. (4). Our correlations between Autobac 1 and agar dilution were similar to theirs in tests with ampicillin and kanamycin against gram-negative bacteria, but the correlations were improved by applying our breakpoints, which further obviated the need to exclude pseudomonas/kanamycin results. We could not confirm the finding of Thornsberry et al. (4) with respect to cephalothin, which in our hands correlated poorly regardless of the breakpoint values used.

We experienced problems with enterococci, as did Thornsberry et al. (4), not only in tests with cephalothin but also with penicillin and clindamycin. We confirmed Thornsberry's observations on tests with penicillin against *S. epidermidis*, but we found a similar problem with penicillin against *S. aureus* and also with ampicillin against both species.

Our assessment indicated that Autobac 1 was reliable for tests of most gram-negative bacteria. We found it technically less exacting than other methods, but the need to retain an alternative system for testing strains of *Haemophilus, Neisseria,* and *Staphylococcus* was inconvenient.

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