# Evaluation of Accelerate- Pheno™ system, an automated Identification and Phenotypic Antibiotic Susceptibility Testing (AST) in Hospital Universitario de la Princesa.

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## Background

The aim of this study was to evaluate the Accelerate-Pheno™ System (Accelerate Diagnostics, Inc.), a rapid and authomated identification (ID) and phenotypic Antibiotic Succeptiblitily Testing (AST) system, comparing with ID by MALDI-TOF MS™ system (Bruker-Daltonics) directly from positive blood cultures (BC) and AST obtained by MicroScan™ Walkaway™ system (Beckman-Coulter)

## Material and methods

We selected 75 positives BC to evaluate the rapid ID obtained with Accelerate-Pheno™ System by Fluorescent *in situ* hybridization (FISH), comparing with ID by MALDI-TOF MS™ system (Bruker-Daltonics), both directly from positive BC. Results from both rapid identification methods were compared with our culture-based Gold Standard ID after 18-24 hours.

The rapid phenotypic AST with minimal inhibitory concentration (MIC) by Accelerate-Pheno™ System directly from 60 positive BC, 22% (n=13) Gram-positive cocci (12 *Staphylococcus* sp and 1 *Enterococcus* spp) and 78% (n=47) Gram-negative bacilli (44 enterobacteriaceae and 3 *P. aeruginosa*) were compared with MicroScan™ Walkaway™ system results, obtained subculture (gold standar), to analyze the categorical concordance.

## Results

### Identification Concordance:

ID by Accelerate-Pheno™ system was succesfull for 92% (n=65) BC: In one case ID was not possible because the pathogen isolated (*Salmonella sp*) is not included in the ID panel. It is noteworthy that Accelerate-Pheno™ system was able to correctly identify the microorganisms isolated in 80% (n=4) of the polymicrobial bacteremia.

Identification by MALDI-TOF MS™ directly from BC was succesfull for 81% (n=61) of samples. None of polymicrobial bacteremia was successful identified.

The time required for identification was 1.5 h for both methods. Results are shown in Table 1.

### AST Categorical Concordance:

Comparation between AST by Accelerate-Pheno™ and MicroScan™ Walkaway™ system shown a Categorical Conncordance of 97.5% for Gram-positive cocci and 90.4% for Gram-negative bacilli. Detailed results are shown in Table 2.

Results from the MicroScan™ Walkaway™ system were obtained in 36-48 h, while those from the Accelerate-Pheno™ System delayed just 7 h.

| | Total positive BC | Gold Standard ID MicroScan™ (%) | Accelerate-Pheno™ (%) | MALDI-TOF MS™ direct from BC (%) |
|---|---|---|---|---|
| Monomicrobial Bacteremia | 70 | 70 (100) | 65 (93) | 61 (87) |
| Polymicrobial Bacteremia | 5 | 5 (100) | 4 (80) | 0 |
| Total positive Blood Cultures identification | 75 | 75 | 69 (92) | 61 (81) |

Table 1) Identification results obtained by MALDI-TOF MS™ directly from BC and Accelerate-Pheno™ system

| Gram negative bacilli | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | AMG | CTX | PTZ | CFTZ | CFP | ETP | MPN | CIP | COL |
| Categorical concordance (%) | 44(93) | 31(71) | 43(92) | 27(88) | 45(96) | 43(98) | 45(96) | 42(90) | 9(90) |
| Minor errors (%) | 4(2,8) | 0 | 0 | 2(6) | 0 | 1(2) | 0 | 3(6) | 0 |
| Mayor errors (%) | 2(1,4) | 9(20) | 1(2) | 1(3) | 1(2) | 0 | 2(4) | 1(2) | 0 |
| Very mayor errors (%) | 4(2,8) | 4(9) | 3(6) | 1(3) | 1(2) | 0 | 0 | 1(2) | 1(10) |

| Saphylococcus aureus and coagulase-negative staphylococcus | | | | | | Enterococcus sp | | |
|---|---|---|---|---|---|---|---|---|
| | CFX | VAN | LZD | DPT | STX | AMP | VAN | LZD |
| Categorical concordance (%) | 8(89) | 12(100) | 9(100) | 12(100) | 11(92) | 1(100) | 1(100) | 1(100) |
| Minor errors (%) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mayor errors(%) | 1(11) | 0 | 0 | 0 | 9(82) | 0 | 0 | 0 |
| Very mayor errors (%) | 0 | 0 | 0 | 0 | 2(18) | 0 | 0 | 0 |

Table 2. Categorical Concordance between AST obtained by Accelerate-Pheno™ System and MicroScan™ Walkaway™ system. AMG (aminoglycosides); CTX (cefotaxime); PTZ (piperacillin/tazobactam) CFTZ (ceftazidime); CFP (cefepime); ETP (ertapenem); MPN (meropenem); CIP (ciprofloxacin); COL (colistin); CFX (cefoxitine); VAN (vancomycin); LZD (linezolid); DPT (daptomycin); STX (cotrimoxazole); AMP (ampicillin)

## Conclusion

The Accelerate-Pheno™ system shown good results identifying pathogens directly from positive BC, including polymicrobial bacteremia, in 1.5 h and offered a phenotypic AST with MIC in 7 h. Using this new technology, physicians could receive this information at least 28 hours early to optimize antimicrobial treatment for patients with severe BSI or sepsis.