Impact of MALDI Mass Spectroscopy on Antibiotic Treatment of Gram-Negative Organisms

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Background and Purpose of Study

- Given limited data on newer microbiology diagnostic methods, we assessed whether MALDI-TOF (matrix assisted laser desorption ionization-time of flight) improved identification time and time for directed antibiotic coverage compared to standard methods (e.g. VITEK-2) across two acute care hospitals in an academic centre in Ontario.

Methods

- Retrospective microbiology and pharmacy data from patients with gram negative bacteremia from January 2016 to December 2017 were collected. Blood cultures who underwent MALDI-TOF diagnostic testing were compared to those with VITEK-2.
- Differences were assessed in (1) identification time, (2) days to initiating directed therapy and (3) time to discontinue inappropriate antibiotics based on identification results.

Study population

- Inclusion criteria: Gram-negative bacteremia, grouped under six species (see Table 1). Only cultures from patients’ first admission during calendar year included (to prevent duplicate entries).
- Exclusion criteria:
  - E. coli (avoid unequal representation of pathogen specimens given high prevalence of E. coli positive cultures)
  - Additional cultures of patient in same calendar year
- Analysis: SPSS; t-test and chi-square test

Results

- Demographics: 381 patient cultures reviewed, 377 met eligibility criteria (3 underwent phenotypic assessment – morphology, oxidase; 1 did not grow organisms of our interest).
  - 48.5% (181/377) processed through MALDI
  - Most prescribed antibiotics: Ciprofloxacin (169/613, 27.6%), piperacillin/tazobactam (156/613, 25.4%), meropenem (83/613, 13.5%), Ceftriaxone (61/613, 9.9%), etamopen (45/613, 7.3%).

- Appropriateness of Antibiotic Changes
  - 181/227 cultures (79.7%) were considered appropriate therapy initiations.
  - Among 95 appropriate discontinuations, MALDI still persisted significantly shorter times (53.09 hours vs 65.00 hours, p= 0.019).

- Mean identification time from positive gram stain also remained significantly different between testing modalities (MALDI 15.59 hours ± 11.80 vs. VITEK 2 28.27 hours ± 14.48 respectively; MD 12.68 hours, 95% CI 9.91 to 15.45, p <0.001).

- Time to susceptibility showed no significant difference for MALDI compared to VITEK-2 (48.69 hours ± 30.35 vs. 52.33 hours ± 22.62 respectively; MD 3.64 hours, 95% CI -1.84 to 9.11, p = 0.193)