O269
Oral Session
PCR and other molecular tests directly on blood: what is new?

Matrix-assisted laser desorption/ionization-time of flight mass-spectrometry (MALDI-TOF MS) directly from positive blood culture flasks allows rapid detection and identification of bloodstream infection (BSI)

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Objectives:

Rapid and etiological diagnosis of BSI is crucial to ensuring effective antimicrobial therapy. Conventional culture requires up to 72 hours from sample collection to pathogen identification. MALDI-TOF is able to identify bacterial species very rapidly and may significantly shorten the time to microbiological identification. We aimed to improve identification directly from positive blood culture vials containing activated charcoal.

Methods:

From positive blood cultures (BacT/ALERT 3D using FN and FA vials from bioMérieux), we compared direct MALDI-TOF analysis (Biotyper, Bruker Daltonik) with conventional identification methodology including VITEK 2 (bioMérieux). Erythrocytes were lysed and activated charcoal was filtered using the SepsiTyper Kit (Bruker Daltonik) including a full protein extraction. A MALDI-TOF score above 1.7 was considered valid.

Results:

A total of 264 consecutive positive blood culture vials were analyzed. 118 of 264 (44.7%) vials showed gram-negative bacteria. Predominant species identified by MALDI-TOF and confirmed by VITEK were *Escherichia coli* (70/72 correct), and *Klebsiella pneumoniae* (12/12 correct). Overall, for gram-negative bacteria the sensitivity was 87.3% and specificity 100%. The median MALDI-TOF score of positive samples was 2.192 (IQR, 1.906-2.300).

112 of 264 (42.4%) vials showed gram-positive bacteria. Predominant species were *Staphylococcus aureus* (20/24 correct), coagulase-negative staphylococci (20/46 correct), and *Enterococcus faecium* (9/10 correct). Overall, for gram-positive bacteria the sensitivity was 60.2% and specificity 93.4%. The median MALDI-TOF score of positive samples was 2.074 (IQR (1.849-2.276). Identification of *Staphylococcus epidermidis* was difficult, reducing the sensitivity. The specificity was reduced for *Streptococcus pneumoniae* due to known similarities of the mass spectra towards streptococci of the mitis/oralis group.

Conclusions:

Using MALDI-TOF and the SepsiTyper Kit allowed to rapidly identify gram-negative bacteria with high sensitivity and specificity despite activated charcoal in blood culture vials. The reduced sensitivity in gram-positive bacteria, likely due to activated charcoal, could be improved using blood culture bottles containing resin.