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Broad range PCR coupled with electrospray ionization mass spectrometry - usefulness in a tertiary infectious diseases centre

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Background: Rapid and reliable diagnosis is needed for timely initiation of appropriate antibiotic treatment. Broad range PCR coupled with electrospray ionization mass spectrometry (PCR/ESI-MS) provide a versatile method to detect and identify more than 780 bacteria and 4 resistance markers directly from clinical specimens in less than 8 hours. The objective of the study was to evaluate the impact of PCR-ESI/MS compared to the phenotypic methods currently used for the diagnosis of bacterial infections in a tertiary level infectious diseases centre.

Material/methods: comparative analysis of PCR/ESI-MS and standard bacteriological phenotypic tests results in paired samples collected within a year from patients admitted in the National Institute for Infectious Diseases, a tertiary infectious diseases centre from Bucharest, Romania. PCR/ESI-MS testing was performed using the IRIDICA System and the BAC BSI, LRT or SFT Assay kits (Abbott Molecular, Des Plaines, IL).

Results: A number of 136 samples were tested in 2016, most of them being blood (47.1%) and the others sterile fluids/tissues (40.4%) or respiratory samples (12.5%). The majority of the sterile fluids/ tissues were cerebrospinal fluid (47 cases); only few samples had pleural, articular, abdominal or medullary origin. The positivity rate was 39.7% for PCR/ESI-MS and 17.6% for standard microbiological tests. Concordant results were obtained in 98 cases (72.1%), 16 of them being matched positive detections. In 32 cases (23.5%) PCR/ESI-MS detected at least one microorganism while culture was negative. Most of these detections were microorganisms commonly associated with bloodstream or central nervous system infections, but in some instances the detected bacteria had been rarely identified in blood (*Mycobacterium tuberculosis complex*, *M. avium complex*, *Fusobacterium nucleatum*, *Streptococcus pyogenes*) or in respiratory samples (*Coxiella burnettii*, *Ureaplasma urealyticum*). In two cases PCR/ESI-MS provided additional detections (*Acinetobacter baumannii, Moraxella catarrhalis*) compared to a single detection by culture and in two cases culture provided an additional detection (*Providencia*, *Enterococcus faecalis*) compared to PCR/ESI-MS. The two methods identified different species from the same genus *(A. calcoaceticus* vs *A. baumannii*) in one case and from different genera in another case. The PCR/ESI-MS results were provided 1 to 3 days earlier for rapid growing bacteria and weeks earlier for mycobacteria.

Conclusions: PCR/ ESI – MS allowed twice more detections of a broader range of bacteria from various clinical samples in a shorter time compared to conventional phenotypic methods. This method might have an important impact on timely selection of targeted antimicrobial therapy and avoidance of unnecessary treatments, especially in critically ill patients. Further studies of compared performance might help to fully understand the significance of the rather small number of discordant results.