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Evaluation of a new automated Acrion system for rapid identification of microorganisms and detection of antimicrobial resistance markers directly from blood cultures in an Italian hospital

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Background: As a recent advance in bloodstream infection diagnostics, the Acrion™ system (ThermoFisher) provides a fully automated workflow for rapid detection of microorganisms and their critical antimicrobial resistance gene products (i.e. *mecA* product PBP2a) directly from positive blood culture (PBC) broths. The system combines liquid chromatography (LC) with high-resolution mass spectrometry (HRMS) for microbial protein analysis. We comparatively evaluated the Acrion™ system workflow and an in-house diagnostic workflow, where PBC broths were analyzed with the MALDI BioTyper® system (Bruker Daltonics) and/or FilmArray® blood culture ID panel (bioMérieux) for microorganism identification and with the eazyplex® MRSA assay (Amplex Diagnostics GmbH) for *mecA* gene detection.

Materials/methods: Using the two workflows, we separately tested broth aliquots from 218 (199 monomicrobial and 19 polymicrobial) PBCs that were consecutively (clinical, n = 195) or *ad hoc* (simulated, n = 36) obtained. Results by each workflow were compared with those of culture-based identification and antimicrobial susceptibility methods (here used as the reference method), and were reported as correct detections, misdetections or no detections, respectively. The time to results were calculated for each workflow.

Results: Of 199 monomicrobial PBCs, 190 (95.5%) yielded results by the Acrion™ system workflow that were concordant with those of the reference method, whereas there were 9 no detection results. In parallel, 192 (96.5%) of the 199 PBCs yielded results by the in-house diagnostic workflow that were concordant with those of the reference method, whereas 7 yielded misdetection results. The overall agreement between the workflows was 92.0%. Furthermore, the Acrion™ system detected at least one microorganism, whereas the in-house diagnostic workflow detected all the microorganisms, in the 19 polymicrobial PBCs. Interestingly, all the 7 *mecA*-positive *Staphylococcus aureus* were correctly detected, 2 *Salmonella* species were correctly identified as *S. enterica* and, ultimately, overall results by the Acrion™ system were available more shortly than those by the in-house diagnostic workflow.

Conclusions: The Acrion™ system is an easy, fast and reliable tool for the laboratory diagnosis of bloodstream infections and integrates multiple crucial tests into a single, effortless workflow.

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