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Poster abstract submission

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Poster title

Investigation of rapid carbapenemase-producing Klebsiella pneumoniae detection using ATR-FTIR spectroscopy coupled with Microbira Advanced Analytical Platform – Infrared (MAAP-IR)

Poster abstract

Antimicrobial resistance (AMR) requires rapid, scalable diagnostics for surveillance across clinical, veterinary, and environmental sectors. The Microbira Advanced Analytical Platform – Infrared (MAAP-IR) uses AI with attenuated total reflectance–Fourier transform infrared (ATR-FTIR) spectroscopy for rapid, reagent-free identification of clinically relevant microbes. This study assessed MAAP-IR for distinguishing KPC-producing from non-KPC-producing Klebsiella pneumoniae.

In collaboration with the Great Ormond Street Institute of Child Health (London, United Kingdom), we evaluated the feasibility of using MAAP-IR as a consumable-free method to discriminate between KPC-producing and non-KPC-producing Klebsiella pneumoniae isolates. A panel of 132 well-characterised isolates (62 KPC-producing, 70 non-KPC) was assembled. All isolates were cultured on blood agar and incubated at 37°C for 24 hours. Following incubation, ATR-FTIR spectra were acquired in triplicate directly from each culture plate, with each sample requiring approximately 3 minutes for analysis. The spectra collected from 108 isolates (51 KPC-producing and 57 non-KPC) were used for training, and the remaining spectra were used as a test set (spectra of 24 isolates).

The model demonstrated strong performance on the test set, achieving an overall classification accuracy of 95.8%. All KPC-producing isolates were correctly identified (100% accuracy; n=11), while non-KPC isolates were correctly classified with 92.3% accuracy (n=12/13). In addition to the main dataset, MAAP-IR was independently evaluated using the reference K. pneumoniae strain NR-15411 (BEI Resources), which carries the blaKPC gene. This isolate was tested independently as part of routine system verification and was not included in the main study dataset. As a result, all replicate spectra yielded high-confidence predictions, with classification results available in under two minutes after spectral acquisition.

MAAP-IR shows strong discriminatory capability for KPC-mediated resistance, offering a rapid, consumable-free screening tool for AMR profiling. Its ability to provide accurate results without reagents or advanced infrastructure highlights potential for integrated AMR surveillance in human, animal, and environmental health under One Health objectives.

Research topic

Diagnostics