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ePoster Viewing
Diagnostic bacteriology – non-culture based, including molecular and MALDI-TOF

Evaluation of a rapid method to detect KPC Carbapenemase based on Maldi-TOF spectra analysis

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Background: One of the main needs for a clinical microbiology lab is to quickly identify patients who carry bacterial strains positive for carbapenemases production, so as, to contain their spreading and to address proper pharmacological therapy
The objective of this study is to standardize the use of Maldi-TOF and quickly identify KPC producers by characteristic peaks related to this carbapenemase activity.

Material/methods: The study included strains isolated from clinical samples of the Microbiology laboratory of the Azienda Ospedaliera Universitaria di Verona, namely:
218 *Klebsiella pneumoniae* strains: 164 carbapenems resistant and 54 cephalosporins resistant by means of ESBL production.
29 *K. pneumoniae*, used as control group, susceptible to all beta-lactams
141 *Escherichia coli* strains: 124 ESBL producers, 6 with decreased susceptibility to carbapenems, and 11 carbapenemases producers.
Other strains included in the study were: 15 carbapenem-resistant Enterobacteriacee strains, carrying either an NDM or VIM enzyme:
Susceptibility testing was performed for all strains by microdilution test following the EUCAST interpretative guideline.
Carbapenemase and ESBL production were confirmed phenotypically by CarbaNP test and ESBL NDP test, respectively.
Carbapenemases genes on *K. pneumoniae* and *E. coli* with decreased susceptibility to carbapenems (namely $bla_{IMP/VIM/KPC}$, bla_{NDM} and bla_{OXA48}) were detected by multiplex and single PCRs
Maldi-TOF was used to analyze spectra and identify a peak of 11109 Da, shown to correlate with the plasmid harboring the gene coding for KPC enzyme (AF Lau *et al.* 2014)

Results: For all strains we confirmed the pattern of resistance by antimicrobial susceptibility testing.
All carbapenem-resistant strains showed carbapenemase production by a positive CarbaNP test and carried a bla_{KPC} gene. One strain co-carried also a bla_{VIM} gene.
All cephalosporin-resistant strains, showed ESBL production by a positive ESBL NDP test. All showed a negative CarbaNP test, and a negative PCR for all carbapenemase genes.
162 out 164 of *K. pneumoniae* and 10 out 11 *E. coli* carbapenem resistant by Maldi-TOF spectra analysis present the 11109 Da peak, correlated with the plasmid harbouring the KPC gene.
Neither the cephalosporin-resistant (ESBL bearing) or the beta-lactams susceptible strains showed the 11109 Da peak in the Maldi-TOF spectra analysis.
Enterobacteriaceae strains harbouring carbapenemase other than bla_{KPC}, namely bla_{NDM} and bla_{VIM} did not show the 11109 Da peak in the Maldi-TOF spectra analysis.

Conclusions: 173 out of 176 Enterobacteriacee strains (*K .pneumoniae* and *E .coli*) carbapenem resistant and KPC producers assayed by Maldi-TOF presented the 11109 Da peak correlated with the presence of a KPC enzyme.

The 11109 Da peak was absent in all ESBL producers, susceptible strains and Enterobacteriaceae strains harbouring different enzyme.
There is a strong correlation between the presence of a 11109 Da peak on Maldi-TOF spectra and the presence of KPC enzymes.