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Paper Poster Session
Recent studies of non-culture techniques for detection of resistance

Evaluation of the novel Xpert® Carba-R v2 assay for the detection of carbapenemase-producing Enterobacteriaceae

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Background: The aim of the present study was to determine the biological performances of a novel version of the Xpert® Carba-R kit, the Xpert® Carba-R v2, which has been improved for the efficient detection of *bla*$_{OXA-181}$ and *bla*$_{OXA-232}$ genes. The Xpert® Carba-R v2 has been tested on a collection of well-characterized enterobacterial isolates with a reduced susceptibility to at least one carbapenem, reflecting the French epidemiology of carbapenemase-producing Enterobacteriaceae (CPE).

Material/methods: A collection of 130 well-characterized enterobacterial isolates: 51 non-CPE including 33 isolates with decreased susceptibility to at least one carbapenem (imipenem, meropenem, or ertapenem) according to EUCAST guidelines and 79 True CPEs consisted of 9 KPC (KPC-2,3 variants), 11 NDM (NDM-1,4,5,6,7),, 9 VIM (VIM-1,2,4,19), 5 IMP- (IMP-1,8,11), 41 OXA-48 like- (20 OXA-48, 2 OXA-162, 9 OXA-181, 5 OXA-204, 3 OXA-232 and 2 OXA-244) producers, and 14 isolates producing multiple carbapenemases (three NDM-1 + OXA-48, six NDM-1 + OXA-181, two NDM-1 + OXA-232, one NDM-5 + OXA-232, one NDM-1 + VIM-2 and one VIM-4 + OXA-48) were tested by the Xpert Carba-R v2. The bacteria were isolated on ChromID® CARBA SMART (bioMérieux), a medium commonly used by clinical bacteriology laboratories in France to detect carbapenemase carriers.

Results: The Xpert® Carba-R v2 was able to detect all KPC, NDM, VIM, OXA-48 variants including OXA-181 and OXA-232. In addition, both resistance determinants were correctly identified in all the multiple carbapenemase-producers. Concerning IMP-type carbapenemases, all IMP-1 group (IMP-1 and IMP-11 in our study) were detected. As claimed by the manufacturer, the two IMP-8 producers, which are not IMP-1 group members, were not detected. Although these enzymes are prevalent in Taiwan, they are yet extremely rare in Europe. None of the non-carbapenemase-producers gave positive PCR results, except for two OXA-163- and one OXA-405-producers. These two OXA-48 variants hydrolyse efficiently expanded-spectrum cephalosporins but are devoid of any carbapenemase activity due to a four amino-acid deletion near the active site. Although OXA-405 was reported from an unique S. marcescens isolate recovered in France, OXA-163 producers that were initially described in Argentina have already spread to Egypt, paving the way for their possible dissemination in North African countries and Europe.

Conclusions: The overall performances of the Xpert Carba-R v2 were high, detecting the five major families of carbapenemases (NDM, VIM, IMP, KPC, and OXA-48). Our study demonstrated that the Xpert® Carba-R v2 kit is now well adapted to the French epidemiology of CPE, which reflects that of many European countries. Extrapolating these results to the global French CPE epidemiology, the Xpert® Carba-R v2 may be able to detect 99.6% (2018/2026) of the CPEs identified by the Associate French NRC between 2012 and 2014, missing only seven IMI- and one FRI-1-producers.