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ABSTRACT

The emergence and spread of carbapenemase producing Enterobacteraeaceae (CPE) is a matter of great public health concern. A rapid identification and confirmation of CPEs is essential to prevent further spread and provide appropriate antimicrobial therapy. Simultaneous detection and identification of carbapenemases is mainly based on molecular tests that are rather expensive and require trained staff. Here, we validated a multiplex Lateral Flow ImmunoAssay (LFIA) named Carba5 to detect NDM, KPC, VIM and IMP-type and OXA-48-like carbapenemase-producing Enterobacteriaceae within 15 minutes.

Methods: LFIA (strip + cassette) were manufactured using our monoclonal antibodies previously produced and selected. Retrospectively, 180 reference enterobacterial isolates with characteristic carbapenemase gene amplicon on UniSelect™ medium, Bioread® and prospectively 116 clinical isolates showing a decreased susceptibility to at least one carbapenem and referred to the French National Reference Centre (NRC) for antibiotic resistance during a one month period were studied. The colony was suspended in extraction buffer (lysT) and after vortexing dispersed on the LFIA. Mipa was allocated for 15 minutes and results were subsequently monitored with a strip reader (prototype) from NG Biotech (Guipry, France).

Results: All 185 isolates expressing a carbapenemase related to one of the Carba5 targets were correctly and unambiguously detected in <15min. All other isolates gave negative results except those producing OXA-163 or OXA-405. OXA-221 was observed with non targeted carbapenemases ESBLs, AmpC or oxacillines. The media didn’t have any influence on the results even when colonies showed strong coloration.

Conclusions: Overall, Carba5 reached 100% sensitivity and 95.3% (retrospectively) to 100% (prospectively) specificity. It is compatible with samples handled in clinical laboratories. Carba5 is efficient, rapid and easy to implement in the routine workflow of a clinical microbiology laboratory for the confirmation of the five main carbapenemases encountered in Enterobacteriaceae.