Universal admission screening for CRE using PCR detects 14-fold more carriers than agar-based methods at a London hospital

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Objectives: Carbapenem-resistant Enterobacteriaceae (CRE) present a serious and emerging threat to healthcare facilities worldwide. Prompt identification of carriers is important in the prevention and control of transmission. We implemented a short period of universal admission screening to compare the detection rate of CRE using PCR compared with agar-based culture.

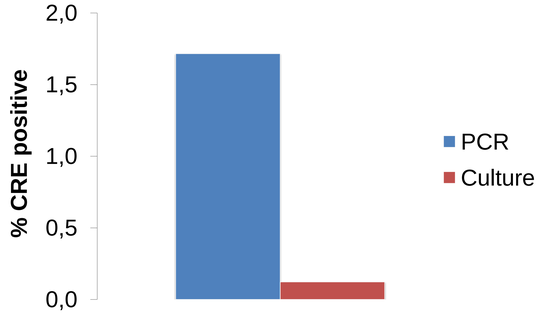
Methods: All patients admitted to two hospitals in London within the previous 72 hours were eligible for screening. We screened 816 patients over a 4 week period. Each patient was asked a series of questions relating to risk factors (Table). A rectal swab was collected from each patient and cultured using chromogenic media for CRE (Carba-SMART ChromID, BioMerieux), non-chromogenic media (MacConkey with an ertapenem disc), and using a PCR assay (CheckDirect, Checkpoints). The rate of CRE carriage detected by PCR vs. culture was compared using a Fisher's exact test.

Table: Risk factor for CRE carriage

Risk factor	n (%)
Mean age	51 years
UK resident	14 (100)
Overseas travel in the past 12 months	5 (36)
Overnight hospital stay in the past 12 months	7 (50)
Antibiotics in the past 6 months	7 (50)
No to all questions	1 (7)
Would meet PHE screening trigger *	5 (36)

* Inpatient overseas, in UK hospital with known problem (including London hospitals) or previous positive case in the past 12 months.

Figure: Rate of CRE carriage by PCR and culture



Results: 14 (2%) of patients were found to be CRE positive by PCR and 1 (0.1%) by culture ($p<0.001$, Figure). The CRE grew on the chromogenic media and not on the MacConkey. 50% of carbapemases were OXA-48, 29% KPC and 21% VIM; no NDM was detected. All CRE carriers were UK residents; most had either been abroad or hospitalised in the past year, or taken antibiotics in the past 6 months. Only 5 (36%) met the screening triggers outlined in the UK CRE Toolkit so most patients would not have been eligible for screening in standard practice (Table).

Conclusion: We found a very low carriage rate of CRE identified by culture (0.1%) but a considerably higher rate by PCR (2%). We believe that this discrepancy is most likely caused by a colonizing load that is below the limit of detection of our culture methods used, even when using sensitive chromogenic media. We did not use enrichment culture since this slows further the diagnostic turnaround time. Only one third of the patients would have been eligible for screening using UK CRE Tookit triggers, suggesting that risk factors to trigger CRE screening require modification. Although PCR is more expensive on a per test basis, it is considerably more sensitive than conventional culture for detecting CRE colonization at the time of hospital admission.