CHROMagar KPC evaluation for detection of carbapenemase producing Enterobacteriaceae

Panayea T,Galani I, Adamou P, Antoniadou A, Giamarellou H.
4th Department of Internal Medicine,Athens University
School of Medicine, University General Hospital ATTIKON, Chaidari, Greece

UPDATED ABSTRACT

Objectives: Our aim was to compare CHROMagar KPC with MacConkey agar with imipenem 1μg/mL for the detection of KPC and VIM producing *Enterobacteriaceae* strains from surveillance cultures. **Methods**: 135 rectal swabs from 120 patients (78 ICU and 42 patholog y/surgery wards) were tested. Swabs were plated on both MacConkey agar with imipenem 1μg/mL(MC) and CHROMagar KPC(Hy labs)(CR) and were incubated at 35oC, O2 for 48h. Identification and antimicrobial susceptibility testing of all different colonies from MC and all different blue colonies from CR was performed by Phoenix (BD). Strains were screened for KPC and VIM by merop-merop+boronic acid and merop-EDTA, ceftaz-EDTA disc respectively and confirmed by PCR methodology. Isolation of *Enterobacteriaceae* on CR was also tested with known VIM + and KPC+ strains. **Results:** Carbapenem resistant strains recovered from MC were: *K.pneumoniae* 44(36 KPC+, 8 VIM+), *P.aeruginosa* 20, *P.mirabilis* 4, *E.cloacae* 1(KPC+), *E.aerogenes* 1(KPC+) and *A.baumannii* 21. CR recovered 54 carbapenemase producing *K.pneumoniae* strains (41 KPC+, 13 VIM+), isolated the first day of incubation. KPC+ strains were 100% non-susceptible to imipenem (MIC>=8) and 95.3% to meropenem (>=8) and VIM+ strains were 93.3% non-susceptible to imipenem an d 53.3% to meropenem. *Enterobacter spp.* strains were not isolated, most probably due to the resemblance of their colonies to the coexisting *K.pneumoniae* strains. *P.aeruginosa* and *A.baumannii* strains exhibited white colonies. P.mirabilis strains were not recovered. Collectively, *K.pneumoniae* isolated strains were 43 KPC+(34 both plates, 7 only CR, 2 only MC) and 15 VIM+(6 both plates, 7 only CR, 2 only MC). Sensitivity of MC and CR for *K.pneumoniae* KPC+ strains was 83.7 and 95.3 and for VIM+ strains 53.3 and 86.6 respectively. All false (-) results on CR were due to the coexistence of VIM+ and KPC+ *K.pneumoniae* strains in the sample(same colonies). On the contrary, in 10 out of 14 false (-) results on MC there was no growth of lac(+) colonies, although strains' imipenem MIC was within non-susceptible range. MC and CR detected carbapenemase producing *K.pneumoniae* strains with an overall sensitivity 80.4, 100 and specificity 97.6, 100 respectively. **Conclusion**: CR detects with high sensitivity and specific ity within 24h either KPC or VIM producing *Enterobacteriaceae* strains in surveillance cultures, allowing immediate implementation of infection control measures to avoid spread of resistant clones.

INTRODUCTION

Carbapenem resistant Enterobacteriaceae(CRE) infection is a worldwide problem associated with high rates of morbidity and mortality, particularly among critically ill patients(1,2). Patients carrying CRE are thought to be the source of transmission in the health care settings(3,4). Surveillance cultures are useful in identifying those patients in order to implement infection control measures.

OBJECTIVES

Our aim was to compare CHROMagar KPC with MacConkey agar supplemented with imipenem 1μg/mL for the detection of KPC and VIM producing *Enterobacteriaceae* strains from stool surveillance cultures.

METHODS

135 rectal swabs from 120 patients(78 ICU and 42 internal medicine/surgery wards) were tested. Swabs were plated on both MacConkey agar with imipenem 1μg/mL(MC+imp) and CHROMagar KPC(Hy labs)(CR) and were incubated at 35°C, O_2 for 48h. Identification and antimicrobial susceptibility testing of all different colonies from MC+imp and all different blue colonies from CR was performed by Phoenix (BD). Strains were screened for KPC and VIM by merop-merop+boronic acid(5) and merop-EDTA, ceftaz-EDTA disc(6) respectively and confirmed by PCR methodology. Isolation of Enterobacteriaceae on CR was also tested with known VIM+ and KPC+ strains.

RESULTS

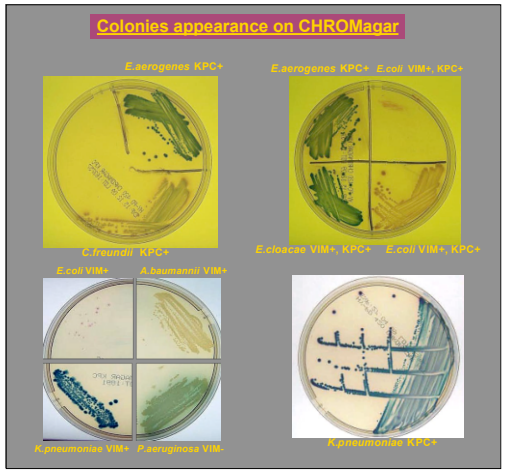
Carbapenem non-susceptible isolates recovered from 135 rectal swabs

- 58 *K.pneumoniae*
- 1 *E.cloacae*
- 1 *E.aerogenes*
- 4 *P.mirabilis*
- 20 *P.aeruginosa* and
- 21 *A.baumannii*

Recovery of *K.pneumoniae* strains from MacConkey agar and CHROMagar

	Both plates (No of strains)	MC+imp (No of strains)	CHROMagar (No of strains)	Total
K.pneumoniae KPC+	34	2	7	43
K.pneumoniae VIM+	6	2	7	15

Colonies appearance on CHROMagar



All four false (-) results on CR and four out of fourteen false (-) results on MC+imp were due to the coexistence of VIM+ and KPC+ *K.pneumoniae* strains in the sample (same colonies).

In the remaining 10 false (-) results on MC+imp, there was no growth of lac(+) colonies, although imipenem MIC of the strains was within non-susceptible range.

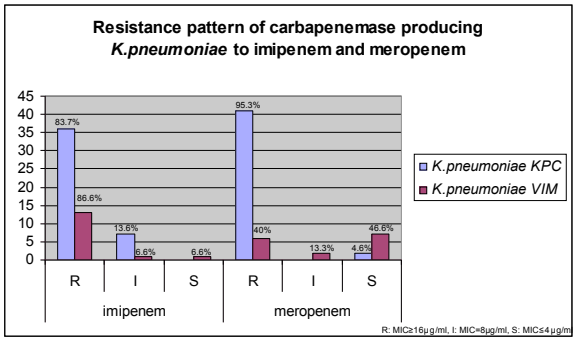
Enterobacter spp. strains were not isolated on CR, most probably due to the resemblance of their colonies to the coexisting *K.pneumoniae* strains

P.mirabilis strains did not grow on CR

Detection of carbapenemase producing *K.pneumoniae* positive samples

- MC+imipenem (1μg/ml): sensitivity 80.4% specificity 97.6%
- CHROMagar : sensitivity 100% specificity 100%

Resistance pattern of carbapenemase producing *K.pneumoniae* to imipenem and meropenem



CONCLUSIONS

CHROMagar detects with 100% sensitivity and specificity, within 24h, either KPC or VIM producing *Enterobacteriaceae* strains in surveillance cultures, allowing immediate implementation of infection control measures to avoid spread of resistant clones.

REFERENCES

1. Schwaber MJ, Carmeli Y. Carbapenem-resistant *Enterobacteriaceae*: a potential threat. JAMA 2008;300:2911-
2. CDC MMWR,March 20, 2009 / 58(10);256-260 Guidance for Control of Infections with Carbapenem-Resistant or Carbapenemase-Producing *Enterobacteriaceae* in Acute Care Facilities
3. Calfee, D., and S. G. Jenkins. 2008. Use of active surveillance cultures to detect asymptomatic colonization with carbapenem-resistant *Klebsiella pneumoniae* in intensive care unit patients. Infect. Control Hosp. Epidemiol. 29:966-8.
4. Samra Z, Ofir O, Lishtzinsky Y, Madar-Shapiro L, Bishara J. Outbreak of carbapenem-resistant *Klebsiella pneumoniae* producing KPC-3 in a tertiary medical centre in Israel. Int J Antimicrob Agents 2007;30:525
5. Tsakris A, Kristo I, Poulou A, Themeli-Digalaki K, Ikonomidis A, Petropoulou D, Pournaras S, Sofianou D. Evaluation of boronic acid disk tests for differentiating KPC-possessing *Klebsiella pneumoniae* in the clinical laboratory. J Clin Microbiol 2009; 47:362–367.
6. Galani I, Rekatsina PD, Hatzaki D, Plachouras D, Souli M, Giamarellou H. Evaluation of different laboratory tests for the detection of metallo-beta-lactamase production in Enterobacteriaceae. J Antimicrob Chemother 2008; 61: 548–553.