# MOLECULAR SCREENING FOR ESBL AND CARBAPENEMASE DURING A PREVALENCE STUDY IN TWO DUTCH HOSPITALS

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## Introduction

Globally, the prevalence of extended spectrum β-lactamase (ESBL) and carbapenemase producing *Enterobacteriaceae* (CPE) has been rising. Traditionally, selective culture methods are used to screen for colonization of patients. However, faster molecular testing methods are now available for this purpose. This study describes the comparison of selective culture and molecular testing for ESBL colonization using the Check-Direct ESBL Screen for BD MAX kit (Checkpoints). Furthermore, screening for CPE using the Check-Direct CPE Screen for BD MAX kit is described. (Checkpoints) .

## Methods

During a period of one month (July 2015), in two Dutch hospitals in South-East Brabant, two rectal swabs (Eswab, Copan) were taken from 479 patients as part of a crossectional prevalence survey. The swabs were pooled and ESBL and CPE qPCR was performed using the Check-Direct ESBL screen and Check-Direct CPE screen qPCR kits on the BD MAX system. These kits can detect the most common ESBL and CPE resistance genes (CTX-M1, CTX-M2, CTX-M9, SHV, KPC, VIM, OXA-48 like and NDM, respectively). Also, all samples were cultured for ESBL. For CPE, only CPE qPCR positives samples were cultured.

ESBL and CPE cultures were performed using a selective broth followed by a subculture on a selective agar. Bacteria suspected for ESBL or CPE according to elevated MIC for Cefotaxim, Ceftazidime, Meropenem or Imipinem, were confirmed for ESBL or CPE by qPCR. Sensitivity, specificity, positive, and negative predictive value and Cohen's Kappa coefficient were calculated for qPCR. Selective culture is used as a the gold standard for the analyses.


## Results

Out of 479 samples, 3% was inhibited in either the ESBL (n=6) or CPE (n=9) qPCR. These samples were excluded from the analyses. Of the remaining 473 ESBL samples, 36 were found positive by culture, and 42 by qPCR .The additional ESBL positives found by qPCR had Cq values between 23 and 43. All discrepant samples were retested in the Check-Direct ESBL screen assay. Results after discrepant analysis are shown in table 1. The Kappa coefficient was calculated and resulted in a inter-rater agreement of 0.9.

A total of eight CPE positives were found in qPCR with Cq values between 39 and 49. None of these CPE's could be cultured.

Table 1. Results ESBL selective culture compared to qPCR

| ESBL | | Selective culture | | |
|---|---|---|---|---|
| | | **Pos** | **Neg** | |
| **qPCR** | **Pos** | **35** (7.4%) | **7** (1.5%) | **42** (ppv 83.3%) |
| | **Neg** | **1** (0.2%) | **430** (90.9%) | **431** (npv 99.8%) |
| | | **36** (sens. 97.2%) | **437** (spec. 98.4%) | **473** |

ppv; positive predictive value, npv; negative predictive value, sens; sensitivity, spec; specificity

## CONCLUSIONS

- Check-direct ESBL kit shows a very good strength of agreement (Kappa coefficient of 0.9).
- Molecular screening is less laborious then culture, and has a high NPV of 99.8%.
- Due to low positivity rate the clinical validation of the Check-direct CPE kit is extended.

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