ESBL-Assay

Detection of extended spectrum $\beta$-lactamases (ESBL) genes in Enterobacteriaceae by PCR

ESBLs (extended spectrum beta-lactamases) positive Enterobacteriaceae are isolated worldwide. These enzymes hydrolyse significantly Penicillins, Cephalosporins and Monobactams.

Most ESBLs are related to the TEM, SHV and CTX-M types and are increasing dramatically in Europe.

Conjugate control
Amplification control
16S Pan Bacteria
TEM AS 104 E (wildtype - wt)
TEM AS 104 K (ESBL)
TEM AS 164 R (wt)
TEM AS 164 S (ESBL)
TEM AS 164 H (ESBL)
TEM AS 238 G (wt)
TEM AS 238 S (ESBL)
SHV AS 179 D (wt)
SHV AS 179 A (ESBL)
SHV AS 179 G (ESBL)
SHV AS 179 N (ESBL)
SHV AS 238/240 (wt)
SHV AS 238/240 (ESBL)
CTX-M
K. pneumoniae carbapenemases (KPCs)

An evaluation study with 424 clinical strains showed a 100% accuracy to detect ESBL genes and the KPC gene. Enterobacteriaceae strains were isolated from: urin, wound respiratory tract, groin, blood culture, vagina and other unspecific body sites (Poster Bloemberg, IMM, University of Zurich, 2012)

Developed for rapid detection of ESBL genes within 5 hours

For culture and clinical specimens

The AID ESBL PCR Test is now available with the detection of Carbapenemases (KPCs)!

References:

Order-No. | Product | Tests |
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RDB2180 | ESBL | 12 tests |
RDB2180X | ESBL | 60 tests |
The AID modular line probe assay for rapid detection of extended spectrum β-lactamases (ESBL) genes in Enterobacteriaceae.

The AID ESBL line probe assay was evaluated for the detection of extended spectrum β-lactamases (ESBL) genes in Enterobacteriaceae. The line probe assay was shown to detect with a 100% accuracy ESBL genes for which oligonucleotide probes are present in the assay. The line probe assay was successfully implemented in the routine diagnostic laboratory for rapid detection of ESBL genes.

Introduction

Increasing prevalence of multidrug-resistant Gram-negative bacteria has continuously been reported over the past years, in particular Enterobacteriaceae producing extended spectrum β-lactamases (ESBLs). ESBLs have the ability to hydrolyse penicillins, first- second- and third-generation cephalosporins and aztreonam (but not cephamycins or carbapenems), and their activity is decreased by inhibitors such as clavulanic acid. Most ESBLs can be classified in TEM, SHV and CTX-M types. TEM and SHV wt genes evolve as ESBL by mutation. ESBL-producing organisms may be responsible for life-threatening infections, leading to increased morbidity, mortality and healthcare-associated costs. A fast and accurate detection of ESBL-carrying bacteria is needed (1). Phenotypic susceptibility testing can be complicated by the presence of multiple β-lactamases, e.g. ESBL’s, AmpC’s and carbapenemases, in one bacterial strain. The purpose of this study was to evaluate an accurate, fast, easy to use and cost efficient molecular line probe assay (AID Autoimmun Diagnostika GmbH, Germany) for the detection of the most prevalent ESBL genes in Enterobacteriaceae.

Assay design

Based on epidemiological analyses of ESBL prevalence an ESBL line probe assay (reverse hybridization) was designed (AID Autoimmun Diagnostika GmbH, Germany) to cover TEM-ESBL (E104K, R164S, R164H, Q238S), SHV-ESBL (D179A, D179G, D179N, mutant aa 238/240) and CTX-M genes (all known classes). An assay design was developed for screening ESBL genes (Fig. 1). In addition, a probe for one of the most prevalent carbapenemases, e.g. Klebsiella pneumoniae carbapenemase (KPC), was included.

1. Specificity AID ESBL kit

Following optimization of the assay design, the ESBL assay was evaluated against a series of clinical ESBL culture isolates and PCR products to test the specificity of the assay. (Table 1). All clinical Enterobacteriaceae isolates had been characterized in detail for antibiotic susceptibility by phenotypic and molecular testing. The line probe assay detected ESBL genes and the KPC gene in clinical strains with a 100% accuracy.

Table 1. Evaluation of the ESBL line probe assay using clinical Enterobacteriaceae strains and fusion PCR amplicons from the Institute of Medical Microbiology (IMM).

<table>
<thead>
<tr>
<th>Organism</th>
<th>TEM</th>
<th>SHV</th>
<th>CTX-M</th>
<th>KPC</th>
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<tbody>
<tr>
<td>E.coli</td>
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<td>K.pneumoniae</td>
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<td>K.oxytoca</td>
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<td>E. coli</td>
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</table>

Conclusions

The ESBL Resistance line probe assay (AID) is a rapid tool for accurate detection of ESBL genes in Enterobacteriaceae. The assay can be implemented readily in the diagnostic laboratory without major equipment investments and is easy to use.

References:


This study was conducted by the Institute of Medical Microbiology, University of Zurich, 8006 Zurich, Switzerland

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