ESBL & AmpC Detection Disc Sets

- Differentiate resistance enzyme types
- Simple comparative interpretation
- Low cost implementation
- Compliance with international standard methodologies
Extended spectrum beta-lactamases (ESBL) are bacterial enzymes which confer resistance to penicillin and cephalosporin antibiotics. The emergence of ESBL producing pathogens has become increasingly significant in limiting the antibiotic treatment options, representing a serious complication for antibiotic management.

Mast's range of ESBL detection discs offers laboratories a simple, reliable and low cost means of identification and detection by double disc diffusion, using paired and combination disc sets.

The presence of an ESBL and/or AmpC is easily determined by zone size comparison when simultaneously tested with antibiotic and antibiotic plus inhibitor combinations.

**Interpretation of results**

<table>
<thead>
<tr>
<th></th>
<th>ESBL Positive</th>
<th>AmpC Positive</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>CPD10</td>
<td>ZA - ZB and ZD - ZC ≥ 5mm and ZD - ZB and ZC - ZA &lt; 5mm</td>
</tr>
<tr>
<td>B</td>
<td>CPD10 + ESBL inhibitor</td>
<td>ZA - ZB and ZD - ZC &lt; 5mm and ZD - ZB and ZC - ZA ≥ 5mm</td>
</tr>
<tr>
<td>C</td>
<td>CPD10 + AmpC inhibitor</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>CPD10 + ESBL inhibitor + AmpC Inhibitor</td>
<td></td>
</tr>
</tbody>
</table>

*AmpC & ESBL Detection Set*

Confirmation of AmpC and/or ESBL production in Enterobacteriaceae

*Calculator programme is available to download from [www.mastgrp.com](http://www.mastgrp.com)*

**AmpC and ESBL Positive**

- ZA - ZB ≥ 5mm
- ZD - ZC ≥ 5mm
- ZA - ZB and ZC - ZA < 5mm

**AmpC and ESBL Negative**

- ZA - ZB < 5mm
- All zones differ by ≤ 2mm
**D69C**

**AmpC Detection Set**

Confirmation of either chromosomal or plasmid acquired AmpC

<table>
<thead>
<tr>
<th></th>
<th>AmpC Positive</th>
<th>AmpC Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>CPD10 + AmpC inducer</td>
<td>CPD10 + AmpC inducer + ESβL inhibitor</td>
</tr>
<tr>
<td>B</td>
<td>ESBL Positive</td>
<td>ESBL Negative</td>
</tr>
<tr>
<td>C</td>
<td>CPD10 + AmpC inducer + ESβL inhibitor + AmpC inhibitors</td>
<td>All zones differ by ≤ 3mm</td>
</tr>
</tbody>
</table>

CPD = Cefpodoxime

**D63C**

**Cefepime 30 & Cefepime 30/Clavulanic Acid 10**

Confirmation of ESβL production in Enterobacteriaceae with chromosomal AmpC

<table>
<thead>
<tr>
<th></th>
<th>ESBL Positive</th>
<th>ESBL Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPM30</td>
<td>Z1 - Z2 ≥ 5mm</td>
<td>All zones differ by ≤ 2mm</td>
</tr>
<tr>
<td>CPM30/CLAV10</td>
<td>Z1 - Z2 ≥ 5mm</td>
<td>All zones differ by ≤ 2mm</td>
</tr>
</tbody>
</table>

CPM = Cefepime
CLAV = Clavulanic Acid

**D52C**

**Extended Spectrum β-Lactamase Set**

Confirmation of ESβL production in Enterobacteriaceae with no chromosomal de-repressed or inducible AmpC

<table>
<thead>
<tr>
<th></th>
<th>ESBL Positive</th>
<th>ESBL Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAZ30</td>
<td>Z1 - Z2 ≥ 5mm and/or Z4 - Z5 ≥ 5mm</td>
<td>All zones differ by ≤ 2mm</td>
</tr>
<tr>
<td>CAZ30/CLAV10</td>
<td>Z1 - Z2 ≥ 5mm</td>
<td>All zones differ by ≤ 2mm</td>
</tr>
<tr>
<td>CTX30</td>
<td>Z1 - Z2 ≥ 5mm and/or Z6 - Z7 ≥ 5mm</td>
<td></td>
</tr>
<tr>
<td>CTX30/CLAV10</td>
<td>Z1 - Z2 ≥ 5mm</td>
<td></td>
</tr>
<tr>
<td>CPD30</td>
<td>Z1 - Z2 ≥ 5mm</td>
<td></td>
</tr>
<tr>
<td>CPD30/CLAV10</td>
<td>Z1 - Z2 ≥ 5mm</td>
<td></td>
</tr>
</tbody>
</table>

CAZ = Ceftazidime
CLAV = Clavulanic Acid
CTX = Cefotaxime
CPD = Cefpodoxime
**D67C**

**Extended Spectrum β-Lactamase Set (CPD10)**
Confirmation of ESβL production in Enterobacteriaceae with no chromosomal de-repressed or inducible AmpC

<table>
<thead>
<tr>
<th>CAZ30</th>
<th>CAZ30/CLAV10</th>
</tr>
</thead>
<tbody>
<tr>
<td>CTX30</td>
<td>CTX30/CLAV10</td>
</tr>
<tr>
<td>CPD10</td>
<td>CPD10/CLAV1</td>
</tr>
</tbody>
</table>

CAZ – Ceftazidime  
CLAV – Clavulanic Acid  
CTX – Cefotaxime  
CPD – Cefpodoxime

**ESBL Positive**

Z₂ - Z₁ ≥ 5mm and/or Z₄ - Z₃ ≥ 5mm

**ESBL Negative**

All zones differ by ≤ 2mm

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**D62C**

**Cefotaxime 30 & Cefotaxime 30/Clavulanic Acid 10**
Confirmation of ESβL production in Enterobacteriaceae with no chromosomal de-repressed or inducible AmpC when both disc sets used concurrently

<table>
<thead>
<tr>
<th>CTX30</th>
<th>CTX30/CLAV10</th>
<th>CAZ30</th>
<th>CAZ30/CLAV10</th>
</tr>
</thead>
</table>

CTX – Cefotaxime  
CAZ – Ceftazidime  
CLAV – Clavulanic Acid

**ESBL Positive**

Z₂ - Z₁ ≥ 5mm and/or Z₄ - Z₃ ≥ 5mm

**ESBL Negative**

All zones differ by ≤ 2mm

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**D66C**

**Cefpodoxime 10 & Cefpodoxime 10/Clavulanic Acid 1**
Confirmation of ESβL production in Enterobacteriaceae with no chromosomal de-repressed or inducible AmpC

<table>
<thead>
<tr>
<th>CPD10</th>
<th>CPD10/CLAV1</th>
</tr>
</thead>
</table>

CPD – Cefpodoxime

**ESBL Positive**

Z₂ - Z₁ ≥ 5mm

**ESBL Negative**

All zones differ by ≤ 2mm
**Antibiotic Susceptibility Testing**

1. **Does zone size comparison indicate an ESBL?**
   - **Yes**: Confirm ESBL using D63C3
   - **No**: **NO ESBL**

2. **Is organism susceptible?**
   - **Yes**
     - **Does organism have Chromosomal AmpC?**
       - **Yes**: Confirm AmpC using D69C2
       - **NO AmpC/ESBL**: Test for AmpC and/or ESBL using D68C1
     - **NO**
       - **NO AmpC/ESBL**: Test for ESBL only

3. **Species with no Chromosomal AmpC:**
   - Escherichia coli
   - Klebsiella spp.
   - Proteus mirabilis
   - Salmonella spp.
   - Shigella spp.

4. **Species with Chromosomal AmpC:**
   - Enterobacter
   - Citrobacter freundii
   - Morganella morganii
   - Providencia spp.
   - Hafnia alvei
   - Serratia spp.

*Refer to Interpretation and Summary Charts*
<table>
<thead>
<tr>
<th>Product Code</th>
<th>Contents</th>
<th>Usage</th>
</tr>
</thead>
</table>
| **D68C**<sup>1</sup><br>4 x 50 discs | A Cefpodoxime 10µg x 1  
B Cefpodoxime 10µg + ESβL inhibitor x 1  
C Cefpodoxime 10µg + AmpC inhibitor x 1  
D Cefpodoxime 10µg + ESβL inhibitor + AmpC inhibitor x 1 | Confirmation of AmpC and/or ESβL production in isolates of Enterobacteriaceae.  
When interpreted as ‘further work required’ use D69C to confirm AmpC production and D63C for confirmation of ESβL production when AmpC is also present. |
| **D69C**<sup>2</sup><br>3 x 50 discs | A Cefpodoxime 10µg + AmpC inducer x 1  
B Cefpodoxime 10µg + AmpC inducer + ESβL inhibitor x 1  
C Cefpodoxime 10µg + AmpC inducer + ESβL inhibitor + AmpC inhibitors x 1 | Confirmation of AmpC production in isolates of Enterobacteriaceae with either plasmid acquired or chromosomal AmpC.  
Can be used when interpreted as ‘further work required’ on D68C for confirmation of AmpC production. |
| **D63C**<sup>3</sup><br>6 x 50 discs | Cefepime 30µg x 3  
Cefepime 30µg + Clavulanic acid 10µg x 3 | Confirmation of ESβL production in isolates of Enterobacteriaceae with chromosomal AmpC e.g. *Enterobacter*, *Citrobacter freundii*, *Morganella* *morganii*, *Providencia* spp., *Hafnia alvei*, *Serratia* spp.  
Can be used when interpreted as ‘further work required’ on D68C for confirmation of ESβL production when AmpC is also present. |
| **D52C**<sup>4</sup><br>6 x 50 discs | Cefazidime 30µg x 1  
Cefazidime 30µg + Clavulanic acid 10µg x 1  
Cefotaxime 30µg x 1  
Cefotaxime 30µg + Clavulanic acid 10µg x 1  
Cefpodoxime 30µg x 1  
Cefpodoxime 30µg + Clavulanic acid 10µg x 1  
Cefpodoxime 30µg + Cefepime 30µg | Confirmation of ESβL production in isolates of Enterobacteriaceae with no chromosomal de-repressed or inducible AmpC e.g. *Escherichia coli*, *Klebsiella* spp., *Proteus mirabilis*, *Salmonella* spp., *Shigella* spp.  
Applicable to CLSI methodology. |
| **D67C**<sup>5</sup><br>6 x 50 discs | Cefazidime 30µg x 1  
Cefazidime 30µg + Clavulanic acid 10µg x 1  
Cefotaxime 30µg x 1  
Cefotaxime 30µg + Clavulanic acid 10µg x 1  
Cefpodoxime 10µg x 1  
Cefpodoxime 10µg + Clavulanic acid 1µg x 1  
Cefpodoxime 10µg + Cefepime 30µg | Confirmation of ESβL production in isolates of Enterobacteriaceae with no chromosomal de-repressed or inducible AmpC e.g. *Escherichia coli*, *Klebsiella* spp., *Proteus mirabilis*, *Salmonella* spp., *Shigella* spp.  
Applicable to CLSI, BSAC and DIN methodology |
| **D62C**<sup>6</sup><br>6 x 50 discs | Cefotaxime 30µg x 3  
Cefotaxime 30µg + Clavulanic acid 10µg x 3  
Cefazidime 30µg x 3  
Cefazidime 30µg + Clavulanic acid 10µg x 3  
Cefpodoxime 30µg x 3  
Cefpodoxime 30µg + Clavulanic acid 1µg x 3  
Cefpodoxime 30µg + Cefepime 30µg | Confirmation of ESβL production in isolates of Enterobacteriaceae with no chromosomal de-repressed or inducible AmpC e.g. *Escherichia coli*, *Klebsiella* spp., *Proteus mirabilis*, *Salmonella* spp., *Shigella* spp.  
Applicable to CLSI methodology.  
**D62C & D64C must be used concurrently**  
Applicable to CLSI methodology. |
| **D64C**<sup>6</sup><br>6 x 50 discs | Cefotaxime 30µg x 3  
Cefotaxime 30µg + Clavulanic acid 10µg x 3  
Cefazidime 30µg x 3  
Cefazidime 30µg + Clavulanic acid 10µg x 3  
Cefpodoxime 30µg x 3  
Cefpodoxime 30µg + Clavulanic acid 1µg x 3  
Cefpodoxime 30µg + Cefepime 30µg | Confirmation of ESβL production in isolates of Enterobacteriaceae with no chromosomal de-repressed or inducible AmpC e.g. *Escherichia coli*, *Klebsiella* spp., *Proteus mirabilis*, *Salmonella* spp., *Shigella* spp.  
Applicable to CLSI, BSAC and DIN methodology |
| **D66C**<sup>7</sup><br>6 x 50 discs | Cefpodoxime 10µg x 3  
Cefpodoxime 10µg + Clavulanic acid 1µg x 3  
Cefpodoxime 10µg + Cefepime 30µg | Confirmation of ESβL production in isolates of Enterobacteriaceae with no chromosomal de-repressed or inducible AmpC e.g. *Escherichia coli*, *Klebsiella* spp., *Proteus mirabilis*, *Salmonella* spp., *Shigella* spp.  
Applicable to BSAC and DIN methodology |