First Extended-Spectrum-\(\beta\)-Lactamase (CTX-M-15)-Producing 
Salmonella enterica Serotype Typhimurium 
Isolate Identified in Lebanon

In Salmonella, most extended-spectrum \(\beta\)-lactamases (ESBLs) are derivatives of TEM and SHV \(\beta\)-lactamase families, although other groups, including PER and CTX-M, have been described recently (1, 2). CTX-M-type ESBLs display levels of resistance to ceftotaxime and ceftriaxone significantly higher than those to cefazidime (2). Since 1995, CTX-M-type ESBLs have disseminated dramatically in several parts of the world (1).

In January 2004, a Salmonella enterica serotype Typhimurium isolate, CAM18, was recovered from a stool specimen collected from a 6-year-old child upon admission to a hospital in Northern Lebanon. The child had no history of travel. The isolate had a high resistance level to ceftotaxime and cefazidime and was also resistant to several aminoglycosides, sulfamethoxazole-trimethoprim, and tetracycline. It was susceptible to cefoxitin, imipenem, quinolones, and chloramphenicol. ESBL production was detected by the double-disk synergy test (6).

The ESBL phenotype was transferred to Escherichia coli K-12 resistant to nalidixic acid with an efficiency of \(10^{-2}\) per donors. Certain transconjugants also acquired resistance to tetracycline and kanamycin (TC-pCAM18-1), while others acquired resistance to tetracycline alone (TC-pCAM18-2).

The addition of clavulanic acid reduced the MICs of all tetracycline and kanamycin (TC-pCAM18-1), while others acquired resistance to tetracycline and kanamycin (TC-pCAM18-2), while tetracycline resistance was exhibited by both transconjugants. This result in addition to plasmid purification revealed that bla\(_{TX-M}\) and kanamycin resistance genes reside on a plasmid of 20 kb and bla\(_{CTX-M-15}\), bla\(_{OXA-30}\), and tetracycline resistance genes reside on a larger plasmid of 60 kb.

We report for the first time the isolation of a CTX-M-type ESBL in Lebanon. In addition, this is also the first report of an ESBL-producing Salmonella in Lebanon. A study done in 2003 at St. George hospital (Beirut, Lebanon) on 49 Salmonella strains showed 100% susceptibility to ceftazidime and cefotaxime (Z. Daoud, personal communication). The appearance of the CTX-M-15-producing S. enterica serotype Typhimurium in the community in 2004 is a serious threat to public health.

We thank Nehmat Salem and Souline Dib for isolating the strain and Guillaume Arlet for generous advice in molecular biology experiments.

### TABLE 1. Characteristics of S. enterica serotype Typhimurium CAM18, E. coli K-12, and two transconjugants

<table>
<thead>
<tr>
<th>Strain</th>
<th>CT/CTL</th>
<th>TZ/TZL</th>
<th>PM/PML</th>
<th>TX</th>
<th>MIC ((\mu)g/ml)</th>
<th>(\beta)-Lactamase</th>
<th>Plasmid size (kb)</th>
<th>Resistance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salmonella serotype Typhimurium CAM18</td>
<td>&gt;256/0.19</td>
<td>128/0.75</td>
<td>&gt;256/0.064</td>
<td>&gt;256</td>
<td>5.4</td>
<td>(\beta)(_{TEM})</td>
<td>~20</td>
<td>R R</td>
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<td></td>
<td>7.3</td>
<td>(\beta)(_{OXA-30})</td>
<td>~60</td>
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<td></td>
<td></td>
<td>8.6</td>
<td>(\beta)(_{CTX-M-15})</td>
<td>~20</td>
<td>R R</td>
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<tr>
<td>E. coli</td>
<td>&gt;256/0.064</td>
<td>32/0.75</td>
<td>128/0.064</td>
<td>&gt;256</td>
<td>5.4</td>
<td>(\beta)(_{TEM})</td>
<td>~20</td>
<td>R R</td>
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<tr>
<td>TC-pCAM18-1&lt;sup&gt;d&lt;/sup&gt;</td>
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<td>7.3</td>
<td>(\beta)(_{OXA-30})</td>
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<td>8.6</td>
<td>(\beta)(_{CTX-M-15})</td>
<td>~20</td>
<td>R R</td>
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<tr>
<td>K-12</td>
<td>0.19/0.19</td>
<td>0.19/0.19</td>
<td>0.047/0.064</td>
<td>0.047</td>
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</table>

<sup>a</sup> Abbreviations: CT, ceftotaxime; CTL, ceftotaxime-clavulanate; TZ, cefotaxime; TZL, cefotaxime-clavulanate; PM, cefepime; PML, cefepime-clavulanate; TX, ceftriaxone.

<sup>b</sup> Abbreviations: Tc, tetracycline; K, kanamycin; R, resistant; S, susceptible.

<sup>c</sup> pl values in bold type indicate the \(\beta\)-lactamases that were positive in the bioassay with ceftotaxime as a substrate.

<sup>d</sup> Transconjugants indicated by TC prefix in the strain designation.
REFERENCES

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