Identification and Characterization of CTX-M-Producing *Shigella* Isolates in the United States

Shigellosis is a major source of gastroenteritis throughout the world (14). Extended-spectrum β-lactamases (ESBLs), including cephalosporinases (CTX-M), confer resistance to extended-spectrum cephalosporins and significantly compromise the treatment options for shigellosis. Numerous ESBLs have been described among *Enterobacteriaceae* (2, 8, 13); however, only a single CTX-M-producing *Shigella* isolate has been reported in the United States (10).

From 1999 to 2007, 3,880 *Shigella* isolates were screened for antimicrobial susceptibility to 14 to 17 antimicrobials by broth microdilution (Sensititre; Trek Diagnostics, Westlake, OH). Six isolates displayed decreased susceptibility (MIC ≤ 2 mg/liter) to ceftriaxone (Table 1). The six case-patients included three males and two females (gender information was unavailable for one patient), and the median age was 3 years (range, 1 to 8 years). Additional details were available for five patients. Three of the five (60%) were hospitalized, and one was admitted twice. One patient had an adopted sibling from Russia but had not traveled herself. The second patient traveled to a neighboring state prior to illness onset, and the third reported no travel. Of the nonhospitalized patients, one was an asymptomatic adoptee from China and the second reported no illness (15).

Table 1. Characterization of CTX-M-positive *Shigella* isolates, transformants, and CTX-M-encoding plasmids

<table>
<thead>
<tr>
<th>Isolate no.</th>
<th><em>Shigella</em> species</th>
<th>State, yr isolated</th>
<th>MIC (µg/ml)</th>
<th>Additional resistance profile</th>
<th>β-Lactamase</th>
<th>Plasmid size (kb)</th>
<th>Plasmid incompatibility type (sequence type)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DH10B</td>
<td><em>flexneri</em></td>
<td>MA, 2002</td>
<td>&lt;0.25/0.25</td>
<td>STR</td>
<td>CTX-M-14</td>
<td>165</td>
<td>A/C</td>
</tr>
<tr>
<td>AM13291</td>
<td><em>flexneri</em></td>
<td>WI, 2003</td>
<td>32/32</td>
<td>AMP, CHL, COT, FIS, GEN, TET</td>
<td>CTX-M-15</td>
<td>165</td>
<td></td>
</tr>
<tr>
<td>DH-13291</td>
<td>—</td>
<td>MA, 2002</td>
<td>32/32</td>
<td>AMP, AUG, COT, GEN, TIO</td>
<td>CTX-M-15</td>
<td>165</td>
<td>A/C</td>
</tr>
<tr>
<td>AM19035</td>
<td><em>flexneri</em></td>
<td>MI, 2004</td>
<td>32/32</td>
<td>STR</td>
<td>CTX-M-15</td>
<td>165</td>
<td></td>
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<tr>
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<td>MA, 2004</td>
<td>32/32</td>
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<td></td>
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<tr>
<td>AM20369</td>
<td><em>sonnei</em></td>
<td>WI, 2003</td>
<td>32/32</td>
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<td>CTX-M-15</td>
<td>165</td>
<td></td>
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<tr>
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<td>—</td>
<td>MA, 2004</td>
<td>&gt;64/64</td>
<td>AMP, STR, TIO</td>
<td>CTX-M-15</td>
<td>165</td>
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<tr>
<td>AM22451</td>
<td><em>sonnei</em></td>
<td>NH, 2005</td>
<td>&gt;64/64</td>
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<td>CTX-M-15</td>
<td>165</td>
<td>I1 (ST31)</td>
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<tr>
<td>DH-22451</td>
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<td>WI, 2005</td>
<td>&gt;64/64</td>
<td>AMP, COT, FIS, STR, TET</td>
<td>CTX-M-15</td>
<td>165</td>
<td>I1 (ST32)</td>
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<tr>
<td>AM22855</td>
<td><em>sonnei</em></td>
<td>NC, 2005</td>
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<td>165</td>
<td>I1 (ST31)</td>
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<td>DH-22855</td>
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<td>NE, 2006</td>
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<td>AMP, STR, TIO</td>
<td>CTX-M-14</td>
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</tbody>
</table>

*a* AMP, ampicillin; AUG, amoxicillin-clavulanic acid; CHL, chloramphenicol; CAZ, ceftazidime; COT, trimethoprim-sulfamethoxazole; CRO, ceftriaxone; CTX, cefotaxime; FEP, cepemipine; FIS, sulfisoxazole; GEN, gentamicin; KAN, kanamycin; NAL, nalidixic acid; STR, streptomycin; TET, tetracycline; TIO, cefotiofur.

Additional drugs tested: AMI, amikacin; CIP, ciprofloxacin; FOX, cefotin.

b* — not applicable.
mids carrying CTX-M-15 have been already described in *Escherichia coli* and *Salmonella* isolates from Australia, France, and the United Kingdom (3).

The emergence of CTX-M-producing *Shigella* isolates in the United States is concerning and necessitates continued resistance surveillance.

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**REFERENCES**


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