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Persistent isolation of Salmonella Concord harbouring CTX-M-15, SHV-12 and QnrA1 in an asymptomatic adopted Ethiopian child in Spain also colonized with CTX-M-14- and QnrB-producing Enterobacteriaceae

Maria-Isabel Morosini1,2*, Aránzazu Valverde3, Maria García-Castillo1, Patrice Nordmann3 and Rafael Cantón1,2

1Servicio de Microbiología, Hospital Universitario Ramón y Cajal, CIBER en Epidemiología y Salud Pública (CIBERESP) and Instituto Ramón y Cajal de Investigación Sanitaria (IRYCIS), Madrid, Spain;
2Unidad de Resistencia a Antibióticos y Virulencia Bacteriana asociada al Consejo Superior de Investigaciones Científicas (CSIC), Madrid, Spain;
3Service de Bactériologie-Virologie, Hôpital de Bicêtre, Paris, France

*Corresponding author. Servicio de Microbiología, Hospital Ramón y Cajal, 28034 Madrid, Spain. Tel: +34-913368330; Fax: +34-913368809;
E-mail: mmorosini.hrc@salud.madrid.org

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Sir,
Endemicity of extended-spectrum β-lactamase (ESBL)-producing Enterobacteriaceae in orphanages has been reported in different developing countries where children and caregivers are colonized with these type of isolates.1 ESBLs in salmonellae are increasing in prevalence, with the propensity to carry more than one ESBL with or without other transmissible resistance mechanisms. We report the persistent recovery of CTX-M-15- and SHV-12-carrying Salmonella enterica serotype Concord isolates also harbouring QnrA1 from the stool cultures of an Ethiopian child in Madrid. The 1-year-old boy, transiently adopted in December 2008 through a non-governmental organization, came from an orphanage in Addis Ababa, Ethiopia, and was immediately admitted to the Paediatric Intensive Care Unit of the Hospital Universitario Ramón y Cajal in Madrid (Spain). Prior to his arrival and due to a febrile syndrome, he had been sequentially treated with standard doses of ceftriaxone, piperacillin/tazobactam and amoxicillin/clavulanate; the latter was suspended due to persistent diarrhoea. Once in Spain, although it was not microbiologically documented, he was clinically diagnosed with urinary sepsis and acute obstructive renal failure. The patient stayed in an intensive care unit for 7 days until surgery to correct an obstructive uropathy. He received meropenem and fluconazole for 19 days. After hospital discharge, oral amoxicillin/clavulanate was administered.

A routine stool culture submitted at admission rendered the isolation of an ESBL-producing Salmonella Concord isolate (S1). Due to the resistance pattern and the infrequent serotype in our country, subsequent stool samples were requested. In addition to standard stool culture plating, the chromogenic agar medium chromID ESBL (bioMérieux, Marcy l’Étoile, France) was used. Intrafamilial faecal carriage of ESBL-producing Enterobacteriaceae was also screened during January–March 2009. The CTX-M-15-producing Salmonella Concord strain 3728 and its Escherichia coli (JS3 Azí) transconjugant were used as controls.2,3 Molecular methods were performed as previously described.4–7

Three additional ESBL-producing Salmonella Concord isolates (S2–S4) as well as three ESBL-producing Escherichia coli (E1–E3) and three ESBL-producing Klebsiella pneumoniae (K1–K3) isolates were recovered monthly (January–March 2009) from the patient. We cannot rule out the potential acquisition of the ESBL-producing E. coli and K. pneumoniae isolates after the child’s arrival in Spain as the search for these isolates was not performed for the first faecal culture. The four Salmonella Concord isolates were resistant to all β-lactams except cefoxitin and carbapenems. Cefotaxime, ceftazidime and cefepime MICs (standard microdilution) were ≥256 mg/L, while those of the combinations cefotaxime/clavulanate and cefotaxime/clavulanate (fixed clavulanate concentration of 4 mg/L) were 1 and 2 mg/L, respectively. These isolates simultaneously produced a CTX-M-15 and an SHV-12 ESBL. Moreover, they were resistant to nalidixic acid (MIC ≥32 mg/L) with a ciprofloxacin MIC of 0.25 mg/L. All isolates were resistant to gentamicin and tobramycin and susceptible to kanamycin, amikacin and netilmicin. They were also resistant to trimethoprim, sulphonamides, tetracycline and chloramphenicol, but susceptible to tigecycline (Table 1).

The first recovered Salmonella isolate (S1) harboured three plasmids of ~50, 100 and 340 kb. Both blaCTX-M-15 and blaSHV-12 genes were demonstrated to be located in the latter non-conjugative plasmid of incompatibility group IncHI2 by hybridization studies. The other three Salmonella isolates contained at least three plasmids ranging from ~50 to 250 kb, but did not harbour the 340 kb plasmid, as did S1 [Figure S1, available as Supplementary data at JAC Online (http://jac.oxfordjournals.org/)]. The location of both blaCTX-M-15 and blaSHV-12 was also demonstrated by hybridization and genes were found on the IncHI2 non-conjugative plasmid of 250 kb. It is of note that the four Salmonella isolates belonged to the same clone as the PFGE patterns were indistinguishable (Table 1) and presented high similarity (two bands of difference) to an isolate previously recovered in France from the stools of an adopted child who had come from Ethiopia.2 Serotype Concord is very unusual in Spain and, during the last 5 years (2004–08), only three serotype Concord isolates (0.01%) were identified in the Spanish Reference Salmonella Laboratory (National Reference Centre, Majadahonda, Spain) and none of them was an ESBL producer (A. Echeita, National Reference Centre, personal communication).

Two out of the three E. coli isolates were genetically related (E1 and E3). The three isolates produced a CTX-M-14 enzyme and one of them (E2) was also positive for qnrB4. In all cases, blaCTX-M-14, was detected on an ~120 kb conjugative plasmid. Two of these plasmids belonged to the IncF group, and the other one was non-typeable (Table 1). The three ESBL-producing K. pneumoniae isolates presented highly related PFGE patterns.
and were also CTX-M-14 producers; two of them harboured the corresponding \(\text{bla}\) gene on an \(\sim 120\) kb conjugative plasmid and the other on an \(\sim 130\) kb conjugative plasmid, all of them belonging to the IncA/C group (Table 1).

Colonization of adoptive children coming from different Ethiopian orphanages with unusual serotype Salmonella Concord isolates in different European countries, carrying CTX-M-15 and SHV-12 ESBLs over a prolonged period of time, is of concern. This situation has already been observed in France and Norway, but represents a new phenomenon in Spain. Foreign-born adoptees represent a group with distinct epidemiological features that deserves attention when preventive measures for reducing transmission of multidrug-resistant bacteria are intended. Taking into account our experience and that previously described in other countries, screening for the carriage of antibiotic-multiresistant bacteria in international adoptees from developing countries could also be included upon children’s arrival in Spain to preclude the possibility of antibiotic resistance dissemination.

Acknowledgements

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Table 1. Characteristics of all isolates recovered during the period of study

<table>
<thead>
<tr>
<th>Isolates(^a)</th>
<th>PFGE type</th>
<th>Month/year</th>
<th>Non-(\beta)-lactam resistance phenotype(^b)</th>
<th>(\text{bla}) genes</th>
<th>Plasmid size (approximate kb)(^c)</th>
<th>Plasmid Inc group(^d)</th>
<th>Qnr type</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>SCA</td>
<td>12/08</td>
<td>TMP CHL TET SUL STR GEN TOB NAL</td>
<td>CTX-M-15; SHV-12</td>
<td>340, 100, 50</td>
<td>IncHI2</td>
<td>A1</td>
</tr>
<tr>
<td>S2</td>
<td>SCA</td>
<td>01/09</td>
<td>TMP CHL TET SUL STR GEN TOB NAL</td>
<td>CTX-M-15; SHV-12</td>
<td>250, 100, 50</td>
<td>IncHI2</td>
<td>A1</td>
</tr>
<tr>
<td>S3</td>
<td>SCA</td>
<td>02/09</td>
<td>TMP CHL TET SUL STR GEN TOB NAL</td>
<td>CTX-M-15; SHV-12</td>
<td>250, 100, 50</td>
<td>IncHI2</td>
<td>A1</td>
</tr>
<tr>
<td>S4</td>
<td>SCA</td>
<td>03/09</td>
<td>TMP CHL TET SUL STR GEN TOB NAL</td>
<td>CTX-M-15; SHV-12</td>
<td>250, 100, 50</td>
<td>IncHI2</td>
<td>A1</td>
</tr>
<tr>
<td>E1</td>
<td>ECA</td>
<td>01/09</td>
<td>SUL STR</td>
<td>CTX-M-14</td>
<td>260, 170, 120, 50, 30</td>
<td>IncA/C</td>
<td>none</td>
</tr>
<tr>
<td>E2</td>
<td>ECB</td>
<td>02/09</td>
<td>TMP CHL TET SUL STR NET KAN GEN TOB AMK</td>
<td>CTX-M-14</td>
<td>170, 120, 40</td>
<td>NA</td>
<td>B4</td>
</tr>
<tr>
<td>E3</td>
<td>ECA</td>
<td>03/09</td>
<td>SUL STR</td>
<td>CTX-M-14</td>
<td>260, 170, 120, 50, 30</td>
<td>IncA/C</td>
<td>none</td>
</tr>
<tr>
<td>K1</td>
<td>KPA1</td>
<td>01/09</td>
<td>SUL STR FOE</td>
<td>CTX-M-14</td>
<td>120, 50</td>
<td>IncA/C</td>
<td>none</td>
</tr>
<tr>
<td>K2</td>
<td>KPA2</td>
<td>02/09</td>
<td>TMP CHL TET SUL STR SPT NET KAN GEN TOB AMK</td>
<td>CTX-M-14</td>
<td>120, 50</td>
<td>IncA/C</td>
<td>none</td>
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<tr>
<td>K3</td>
<td>KPA3</td>
<td>03/09</td>
<td>SUL STR FOE</td>
<td>CTX-M-14</td>
<td>120, 50</td>
<td>IncA/C</td>
<td>none</td>
</tr>
</tbody>
</table>

\(^a\)S, Salmonella Concord; E, E. coli; K, K. pneumoniae.

\(^b\)TMP, trimethoprim; CHL, chloramphenicol; TET, tetracycline; SUL, sulphonamides; SPT, spectinomycin; STR, streptomycin; GEN, gentamicin; TOB, tobramycin; AMK, amikacin; NET, netilmicin; KAN, kanamycin; NAL, nalidixic acid; FOE, fosfomycin.

\(^c\)Plasmid sizes harbouring \(\text{bla}\_\text{ESBL}\) gene(s) are underlined.

\(^d\)NA, non-typeable.

Transparency declarations

None to declare.

No Ethics Committee approval was required for this study. Patient and adoptive-family privacy was strictly maintained during the study.

Supplementary data

Figure S1 is available as Supplementary data at JAC Online (http://jac.oxfordjournals.org/).

References


