Drug Resistant E. coli Found in Drinking Water in Rural Uganda
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Introduction

Drinking Water in Uganda is highly contaminated with bacteria. In the last 20 years, the nomadic cattle herders in the Mbarra District were settled and water sources used consist of natural and manmade pools shared by the people and cattle. Fifty-two water sites were sampled and returned to Seattle were E. coli was isolated.

The Aim of the Project:
1) Verify that the isolates are E. coli
2) Use Pulse-field Gel Electrophoresis (PFGE) to determine if isolates from same water site were the same or different
3) Determine antibiotic susceptibility
4) Determine genes carried in resistant strains

Materials & Methods

- **Bacterial strains.** 33 isolates from 15 water holes
- **Pulsed-Field Gel Electrophoresis (PFGE).** Enzymes used XbaI
- **Disk Diffusion Susceptibility.** Ampicillin (Ap), cefotaxime (CTX), cefazidime (CAZ), chloramphenicol (Cm), kanamycin (Kn), tetracycline (Tc), minocycline (Min), trimethoprim-sulfamethoxazole (SXT)
- **Identification of Genes.** Polymerase-chain reaction assays (PCR) used β-lactamase (TEM-1), tetracycline (tet), integrase (intI1), sulphonamid (sufl); the last 2 test for integrons [gene capture systems]

Results

### TABLE 1. Phenotype and Genotype of Eight Resistant Isolates

<table>
<thead>
<tr>
<th>Water site</th>
<th>Isolate ID #</th>
<th>PFGE type</th>
<th>Antibiotic Resistance</th>
<th>sufl</th>
<th>TEM-1</th>
<th>tet</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>11703-301</td>
<td>1</td>
<td>R=Ap, Tc, SXT; S=Cm, Kn</td>
<td>-</td>
<td>+</td>
<td>A*</td>
</tr>
<tr>
<td>2</td>
<td>11703-302</td>
<td>2</td>
<td>R=Tc, SXT; S=Ap, Cm, Kn</td>
<td>+</td>
<td>+</td>
<td>A*</td>
</tr>
<tr>
<td>3</td>
<td>11703-304</td>
<td>3</td>
<td>R=Ap, Tc, SXT, S=Cm, Kn</td>
<td>+</td>
<td>+</td>
<td>A</td>
</tr>
<tr>
<td>4</td>
<td>12301-387</td>
<td>4</td>
<td>R=Ap, Tc, SXT; S=Cm, Kn</td>
<td>+</td>
<td>+</td>
<td>A</td>
</tr>
<tr>
<td>5</td>
<td>20502-317</td>
<td>5</td>
<td>R=Ap; S=SXT, Cm, Tc, Tc, Min</td>
<td>ND</td>
<td>+</td>
<td>ND</td>
</tr>
<tr>
<td>6</td>
<td>10101-7</td>
<td>6</td>
<td>I=Kn; S=Ap, SXT, Cm, Tc, Min</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
</tr>
<tr>
<td>7</td>
<td>10202-71</td>
<td>7</td>
<td>I=Kn; S=Ap, SXT, Cm, Tc, Min</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
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<tr>
<td>8</td>
<td>20701-326</td>
<td>8</td>
<td>I=Kn; S=Ap, SXT, Cm, Tc, Min</td>
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<td>ND</td>
<td>ND</td>
</tr>
</tbody>
</table>

* Currently confirming

### Conclusions

- **30% of E. coli antibiotic resistance, much lower than found in human African isolates**
- **E. coli did not have genes for class 1 integron: not typical for bacteria in urban centers**
- **Data suggest the environmental bacteria have limited exposure to antibiotics**

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Typical Water Site

"Mbarra District" and "Uganda" are indicated on the map.