Occurrence and Antimicrobial Resistance of *Escherichia coli* O157: H7 and *Salmonella* in the Milk and Feces of Lactating Dairy Cows and Camels in Borana Pastoral Community, Ethiopia

Diriba Hunduma¹, Silvia Alonso², Getahun Agera³, Oudessa Kerro Dego¹, Barbara Wieland³, Hiwot Desca², Delia Grace³, Kebede Amenu⁴

¹Arsi University; ²ILRI; ³USDA-ARS; ⁴University of Tennessee; ⁵Addis Ababa University. Email: amenum@gmail.com (For correspondence)

Introduction

- Milk plays a significant role in human nutrition
- If not properly handled, milk can also be a source of milk-borne microbial infections in humans
- *Escherichia coli* O157: H7 and *Salmonella* are common milk-borne bacteria causing intestinal and extra-intestinal infections in humans
- Studies reporting the occurrence of the pathogens in developing countries like Ethiopia especially under pastoral livestock production system are scarce

Purpose

To investigate the occurrence and antimicrobial resistance of *E. coli* O157: H7 and *Salmonella* in milk and feces of lactating dairy cows and camels raised under pastoral livestock production system.

Methods

**Study area**

Cattle, camels, goats, and sheep
Cow milk is highly preferred for its taste
Higher volume of camel milk is appreciated by pastoralists
Goat milk is also consumed

**Sample collection and processing**

Paired fecal (≈15g) and milk (30 ml) were collected from lactating cows (n = 150) and camels (n = 92) and cultured
Pre-enrichment: 10 g feces or 10 ml of milk in 90 ml of buffered peptone water
Immunomagnetic separation using pathogen specific beads
*E. coli* O157:H7 isolated on CHROMAgar-O157 and identified using latex agglutination test
*Salmonella* was enriched in Rappaport Vassiliadis broth and isolated on XLD agar

**Results**

**Table 1: Prevalence of *E. coli* O157: H7 and *Salmonella* in the feces and milk of cows and camels**

<table>
<thead>
<tr>
<th>Livestock species</th>
<th>Samples</th>
<th>Number tested</th>
<th>E. coli O157: H7</th>
<th>Salmonella</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cattle Feces</td>
<td>150</td>
<td>4.7</td>
<td>4.0</td>
<td></td>
</tr>
<tr>
<td>Cattle Milk</td>
<td>150</td>
<td>4.7</td>
<td>8.6</td>
<td></td>
</tr>
<tr>
<td>Camel Feces</td>
<td>92</td>
<td>3.3</td>
<td>1.1</td>
<td></td>
</tr>
<tr>
<td>Camel Milk</td>
<td>92</td>
<td>0</td>
<td>2.1</td>
<td></td>
</tr>
</tbody>
</table>

**Antimicrobial resistance**

All isolates of both pathogens were resistant to ampicillin (AMP)
All isolates were susceptible to nalidixic acid, gentamicin and ciprofloxacin

**Table 2: Multi-drug resistance of the bacteria isolates**

<table>
<thead>
<tr>
<th>Livestock</th>
<th>Bacteria</th>
<th># isolates</th>
<th>Resistance profile (number of isolates)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cattle</td>
<td><em>E. coli</em> O157: H7</td>
<td>14</td>
<td>TE, AMP (2) S, AMP (2) K, AMP (1) S, TE, AMP (4) S, TE, TR, AMP (4)</td>
</tr>
<tr>
<td></td>
<td><em>Salmonella</em></td>
<td>19</td>
<td>AMP (16) S, TE, AMP (2) K, Amp (1) S, TE, AMP (4)</td>
</tr>
<tr>
<td>Camel</td>
<td><em>E. coli</em> O157: H7</td>
<td>3</td>
<td>AMP (3)</td>
</tr>
<tr>
<td></td>
<td><em>Salmonella</em></td>
<td>3</td>
<td>AMP (1) S, AMP (2)</td>
</tr>
</tbody>
</table>

**Significance**

- Considerable proportions of milk samples, especially from cattle, were positive for drug-resistant pathogens and this could be a significant public health risk.
- Further studies involving different species of livestock and environmental samples would provide a “One-Health” information
- Interventions to reduce the potential milk-borne transmission (e.g. by promoting boiling milk before consumption) and targeted education on prudent use of antimicrobials are recommended.

Disclaimer

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*Ciprofloxacin (C), Ampicillin (AMP), Tetracycline (T), Trimethoprim (TR), Kanamycin (K)*