First description of a Shiga toxin-producing *Escherichia coli* O103:H2 strain isolated from sheep in Brazil

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**Introduction**

Shiga toxin-producing *Escherichia coli* (STEC) comprise an important group of zoonotic pathogens causing a broad spectrum of disorders in humans, including mild to severe diarrhea, hemorrhagic colitis (HC) and the life-threatening condition hemolytic uremic syndrome (HUS). Although most outbreaks and sporadic cases of STEC have been attributed to strains belonging to serotype O157:H7, the frequency of non-O157 STEC infections is increasing in several regions [1]. More than 400 non-O157 STEC serotypes have been described so far and a considerable proportion of them have been linked to human illness [1,2]. In Brazil, human infections due to STEC are mainly associated with non-O157 serotypes, of which O26:H11, O103:H2 and O111:H8/H- (non-motile) accounted for the majority of cases [3-5].

STEC O103:H2 was first described as a causative agent of HUS in 1992 [6]. Since then, serotype O103:H2 has been implicated either in outbreaks or in sporadic cases of gastroenteritis and HUS in Europe [7,8], Japan [9] and the United States [10,11]. In Brazil, STEC O103:H2 was isolated for the first time in 1986, and re-emerged years later as causative agent of infantile diarrhea and hemolytic anemia [4,5]. Despite the fact that multiple STEC strains have already been isolated from farm animals, such as cattle [12] and pigs [13] in Brazil, none of them belonged to the known pathogenic serotype O103:H2 and did not display the virulence repertoire commonly associated with severe human disease (i.e., stx plus eae and/or ehxA genes). This is the first report of STEC O103:H2 isolated and characterized from animals in Brazil.

**The Study**

Ten sheep flocks located on southern Brazil were tested between April and September 2010. Fecal samples were collected from 130 healthy animals, streaked onto MacConkey agar and lactose-fermenting colonies were biochemically characterized as *E. coli* [14]. STEC strains were identified by detection of *stx1*, *stx2*, *eae* and *ehxA* virulence genes [15] and serotyped as previously described [16]. Twenty-three different STEC serotypes were detected (data not shown), including O103:H2, carrying *stx1, eae* and *ehxA* genes which was isolated from a 4-week-old lamb. Intimin type ε was identified in this strain [16]. The *stx1 eae-ε ehxA* virulence gene profile is commonly observed among STEC O103:H2 strains [4,5,7,9]. *Stx1* expression was confirmed by cytotoxicity and neutralization assays on Vero cells [17], and enterohemolysin production was evidenced by the appearance of lysis zone on washed sheep blood agar plates [17]. The genotypic and phenotypic characteristics observed were similar to those of O103:H2 strains previously isolated from patients with diarrhea and hemolytic anemia in Brazil (Table 1).
A low prevalence of STEC O103:H2 in sheep has been also documented in other studies [18], supporting our results and suggesting that the occurrence of this serotype in ovine seems to be uncommon. However, STEC O103:H2 outbreaks and sporadic cases have been traced to contact with animals [7] as well as to consumption of contaminated meat [11], indicating that transmission of strains belonging to this serotype can occur between animals and humans.

**Conclusion**

The potential role of animals in the epidemiology of STEC O103:H2 human infection is still poorly understood in Brazil. In the present study, we described for the first time the isolation and characterization of STEC O103:H2 of animal origin in this country. This strain exhibited virulence features similar to those of human clinical strains, suggesting that sheep may be carriers, albeit at low frequency, of potentially human-pathogenic STEC O103:H2. However, more studies are needed to establish sheep and other animal species as source of STEC O103:H2 infection in our settings.

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**References**


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**Table 1. Characteristics of ovine STEC O103:H2 compared to human O103:H2 strains isolated in Brazil.**

<table>
<thead>
<tr>
<th>Strain</th>
<th>Serotype</th>
<th>Origin</th>
<th>Genotypic and phenotypic characteristics</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>495-12</td>
<td>O103:H2</td>
<td>HD</td>
<td>stx1 eae eхаA</td>
<td>[4,5]</td>
</tr>
</tbody>
</table>

(1)S: sheep; HA: hemolytic anemia; HD: human diarrhea
(2)Stx: cytotoxic activity; Ehly: production of enterohemolysin

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127


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**Conflict of interests:** No conflict of interests is declared.