Prevalence and Biotypes of *Campylobacter* Species Isolated from Sheep in Sokoto State, Nigeria

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**Abstract:** Rectal swabs (faecal) samples were collected from 518 sheep across Sokoto state and processed for *Campylobacter* organisms. Of a total of 518 samples, 93 (18.0%) yielded *Campylobacter* organisms. The *Campylobacter* species isolated in this study were *Campylobacter jejuni*, *Campylobacter coli*, *Campylobacter lari* and *Campylobacter upsaliensis*. The most frequently isolated *Campylobacter* species was *C. jejuni* (79.6%), while *C. upsaliensis* had the lowest isolation rate of 2.2%. Biotyping of the isolates indicated that *C. jejuni* biotype I (44.6%) and *C. coli* biotype I (72.7%) were the most common biotypes while all the *C. lari* isolates were biotype II. The isolation of *Campylobacter* organisms and the identification of *C. jejuni* biotype I and *C. coli* biotype I from sheep in this study is a clear indication of the presence of *Campylobacter* in sheep in Sokoto state. *Campylobacter* organisms must be considered as potential agent of ovine enteritis and abortion as well as a serious public health problem.

**Key words:** Biotypes, *Campylobacter*, Nigeria, Prevalence, Sheep, Sokoto

**INTRODUCTION**

*Campylobacter* organisms are said to be responsible for a wide variety of disorders in cattle, sheep and pigs. Since the development of more sophisticated isolation techniques, by Skirrow and Blaser, the true disease potential of these organisms has become apparent and today some *Campylobacter* infections are regarded as zoonoses, which are capable of being transmitted to man by domestic animals. In sheep, *Campylobacter* species causes abortion, still births and birth of weak lambs during late pregnancy (Kimberling, 1988). The disease is caused by *Campylobacter jejuni*, and *Campylobacter fetus*. The infection is highly contagious and may cause up to 70% of ewes to abort when the organisms are newly introduced into the flock (Dennis, 1990).

In Nigeria, sheep are mostly raised under extensive (free range) system, where the animals are taken out to graze and fend for themselves in the morning hours. However, there are very few households that keep sheep under intensive system of sheep management. Generally, sheep are often kept in combination with other domestic animals (cattle, sheep, goats, camel and poultry) where veterinary care are usually low or absent. The management system in practice encourages the transmission of infectious agent within and flocks. Susceptible ewes may acquire infection through ingestion of contaminated *Campylobacter* organism with fetal material or uterine discharge and ingestion of fecal contaminated feed and water from carrier sheep and other mammals (Simbert, 1969).

Epidemiological studies in developed countries have identified sources of *Campylobacter* enteritis in man to include animals, food, water and milk (Skirrow, 1982; Pебody et al., 1997; Frost et al., 2002). However, sporadic reports of *Campylobacter* infections have recorded in developing countries including Nigeria (Olusanyo et al., 1983; Coker and Dosunmu, 1984; Alabi et al., 1986; Ani et al., 1988; Adegbola et al., 1991; Raji et al., 2000; Coker et al., 2002; Uaboi-Egbenni et al., 2008). Observations from previous studies on the prevalent biotypes of *Campylobacter* isolates from humans (Alabi et al., 1986) and animal sources especially food animals (Olubunmi and Adeniran, 1986; Adegbola et al; 1991; Raji et al., 2000; Uaboi-Egbenni et al., 2008; Baserisalehi et al., 2007) has implicated food animals in human campylobacter enteritis. A better understanding of the epidemiology of *Campylobacter* infection is important in formulating effective control and prevention measures.

Based on the foregoing evidence and to achieve information regarding presence of *Campylobacter* in Sokoto state, the study was conducted to establish the presence and determine the prevalence of *Campylobacter* in sheep in Sokoto state, Nigeria.

**MATERIALS AND METHODS**

A total of 518 fecal samples were collected from apparently healthy sheep and examined within 12 months (December, 2007 to November, 2008). These samples were collected from sheep flocks across the state. The samples were collected from the animals using a sterile...
swab sticks (Evapon Sterile swab sticks®), inoculated into sterile Amies transport medium (Oxoid, CM425) which served as transported and enrichment medium, and transferred to the laboratory immediately. Modified CCDA-Preston medium (Oxoid, CM739) supplemented with CCDA selective supplement (Oxoid, SR 155E) was used as primary isolation medium. The plates were incubated at 37°C for 48-72h under microaerophilic conditions (CampyGen, Oxoid, CN35A). All suspected colonies were identified by Gram staining, oxidase test, catalase test and standard biochemical methods described by Atabay and Corry (1997). Organism were considered to be Campylobacter species if they were motile, catalase positive, oxidase positive, reduced nitrate to nitrite, grow at 37°C and 42°C (Coker and Adefoso, 1994; Atabay and Corry, 1997).

Biotyping of Campylobacter isolates was carried out using the new extended scheme described by Lior (1984). According to the scheme Campylobacter jejuni is divided into four biotypes (I, II, III and IV), Campylobacter coli is divided into two (I and II) while Campylobacter lari is also divided into two (I and II) based on three tests viz., Hippurate, rapid H2S and DNase test.

RESULTS

Of the 518 samples, 93 (18.0%) samples were positive for Campylobacter organisms. This therefore, implies that 18.0% of the sheep in the state harbors Campylobacter. The Campylobacter species isolated from the samples were Campylobacter jejuni, Campylobacter coli, Campylobacter lari and Campylobacter upsaliensis (Table 1). The most common Campylobacter species in this study was Campylobacter jejuni with 79.6% isolation rates, while Campylobacter upsaliensis had the lowest isolation rate of 2.2%. This implies that Campylobacter jejuni is the most common Campylobacter species in sheep in the state.

Table 2 shows the different biotypes of Campylobacter species isolated from sheep in this study. The most common biotype of Campylobacter jejuni in sheep in this study was biotype I accounting for 44.6% of the Campylobacter jejuni isolates, while biotype I (72.7%) was the most common biotypes of Campylobacter coli. However, all the Campylobacter lari isolates were biotype II (100%).

DISCUSSION

Infection with Campylobacter is established zoonosis and the organisms can be transmitted to human via food, water and through contact with farm animals and pets. In order to ascertain the likely sources of Campylobacter, it is necessary to characterize strains which are commonly isolated from food chain and environment and to identify these strains in human infections.

The result of this study indicates that the overall isolation rate of Campylobacter from ovine was 18%. The isolation rate in this study was however lower than 29.3% prevalence rate reported by Hutchison et al., (2004) and Stanley et al., (1998). But higher than those of Turkson et al., (1988), with the prevalence rate of 2.0% from rectal swabs of healthy sheep in Kenya. Raji et al., (2000) reported a prevalence of 3.54% from sheep in Kaduna State, Nigeria, Olubunmi and Adeniran (1986) reported 6.25% prevalence rate from western Nigeria and 6.9% prevalence rate as reported by Abraham et al., (1990) in Ghanaian Sheep; 7.1% in Lagos by Uabor-Egbeni et al., (2008). The results were however, different from that of Adegbola et al., (1991) and Adeotosoye and Adeniran (1987) who failed to isolate any campylobacter organism from healthy sheep and goats in their studies in Ille-Ife Nigeria.

The most frequently isolated Campylobacter spp. from sheep in this study was C. jejuni. The observation is in agreement with the findings of Stanley et al (1998) and Verma et al. (2005), who reported a higher isolation rate of C. jejuni than other Campylobacter spp. from sheep. The low rate of isolation of C. coli and C. lari from sheep in this study is consistent with the findings of Adegbola et al. (1990), Raji et al. (2000), Verma et al. (2005), Baserisalehi et al. (2007) and Uabor-Egbeni et al. (2008), that the isolation rates of C. coli and C. lari are usually lower than that of C. jejuni. The very low rate of isolation of C. upsaliensis and absence of other non-thermophilic campylobacters may be associated with the incubation temperature of 42°C which optimized the growth of thermophilic campylobacters. However, the use of CampyGen gas generating system may have further suppressed the growth of non-thermophilic campylobacters like C. sputorum, C. concisus, C. mucosalis, C. hyointestinalis, as the system does not create hydrogen–enriched atmosphere, which is required by the non-thermophilic campylobacters (Workman et al., 2005).

The most predominant biotypes of C. jejuni from sheep were Biotypes I and II. Biotype I constitute 45.1% while biotype II had 28.2%. The findings here were similar to those of Olubunmi and Adeniran (1986) who reported 58% isolation rate for C. jejuni biotype I from

<table>
<thead>
<tr>
<th>Campylobacter species</th>
<th>Number positive</th>
<th>Isolation rate (%)</th>
</tr>
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<tbody>
<tr>
<td>Campylobacter jejuni</td>
<td>74</td>
<td>79.6</td>
</tr>
<tr>
<td>Campylobacter coli</td>
<td>11</td>
<td>11.8</td>
</tr>
<tr>
<td>Campylobacter lari</td>
<td>6</td>
<td>6.4</td>
</tr>
<tr>
<td>Campylobacter upsaliensis</td>
<td>2</td>
<td>2.2</td>
</tr>
<tr>
<td>Total</td>
<td>93</td>
<td>100</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Campylobacter sp.</th>
<th>Different biotypes</th>
<th>Number positive</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>C. jejuni</td>
<td>Biotype I</td>
<td>33</td>
<td>44.6</td>
</tr>
<tr>
<td></td>
<td>Biotype II</td>
<td>21</td>
<td>28.4%</td>
</tr>
<tr>
<td></td>
<td>Biotype III</td>
<td>12</td>
<td>16.2</td>
</tr>
<tr>
<td></td>
<td>Biotype IV</td>
<td>8</td>
<td>10.8%</td>
</tr>
<tr>
<td>C. coli</td>
<td>Biotype I</td>
<td>8</td>
<td>72.7</td>
</tr>
<tr>
<td></td>
<td>Biotype II</td>
<td>3</td>
<td>27.3</td>
</tr>
<tr>
<td></td>
<td>Biotype I</td>
<td>0</td>
<td>0.0%</td>
</tr>
<tr>
<td></td>
<td>Biotype II</td>
<td>6</td>
<td>100.0</td>
</tr>
</tbody>
</table>
sheep, Raji et al., (2000) who reported 40.3% isolation rate for C. jejuni biotype I from sheep in Kaduna state and Verma et al., (2005) who also reported that majority of the C. jejuni isolates from sheep were biotype I. The study however, disagree with the findings of Abraham et al., (1990) who reported C. jejuni biotype II as the predominant biotype of C. jejuni isolates from sheep in Ghana. The variation in terms of C.coli biotypes may be due to geographical parameter, as all the study in Nigeria reports biotype I but studies outside Nigeria reports biotype II. The predominant C. coli biotype in this study was biotype I. This observation agree with the findings of Adesiyan et al., (1992) and Raji et al.,(2000) who reported C. coli biotype I as the most common C. coli isolates from sheep in Trinidad and Tobago and Zaria, Nigeria respectively. Uaboi-Egbeni et al., (2008) also reported that C. coli biotype I was the predominant biotype of C. coli isolates from sheep in Lagos, Nigeria. The only C. lari biotype isolates from sheep in this study was biotype II. This is contrary to the reports of Raji et al.,(2000) and Uaboi-Egbeni et al., (2008) who observed in their studies, that C. lari biotype I was the most dominant biotype of C. lari isolates from sheep in Zaria and Lagos respectively.

The isolation of campylobacter organisms and the identification of C. jejuni biotype I and C. coli biotype I from sheep in this study is a clear indication of the presence of campylobacter in sheep in sokoto state. The identification of these biotypes in sheep is of serious public health importance, since these biotypes have been implicated in causing the disease in humans. Campylobacter organisms must be considered as potential agent of ovine enteritis and abortion as well as a serious public health problem.

REFERENCES


