Abortion Associated with *Campylobacter upsaliensis*

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*Campylobacter upsaliensis* was isolated from the blood and fetoplacental material of an 18-week-pregnant woman who had contact with a household cat. We believe this is the first report of abortion associated with *C. upsaliensis* infection.

*Campylobacter upsaliensis*, also known as catalase-negative or weakly reacting thermotolerant *Campylobacter* species, was first isolated from the feces of healthy and diarrheic dogs in 1983 (12). *C. upsaliensis* has been isolated from feces of children and adults with diarrhea (4, 10, 15), from blood of pediatric patients and adults with sepsis (6, 9, 10), and from a breast abscess (3).

*Campylobacter* infections occurring during pregnancy are infrequently recognized and have been associated with spontaneous abortion, stillbirth, prematurity, and neonatal sepsis (8, 13, 14). A review of cases revealed that the species involved are *C. fetus* subsp. *fetus*, *C. jejuni*, and *C. coli* (14). To our knowledge, *C. upsaliensis* infection associated with abortion has not been reported. In this paper, we report for the first time the isolation of *C. upsaliensis* from the blood and fetoplacental material of a woman who aborted after having contact with an asymptomatic cat.

A 26-year-old woman was admitted to our hospital with a 3-day history of fever and mild diarrhea and a 2-day history of lower abdominal pain and mild vaginal bleeding. According to the date of her last menstrual period, she was 18 weeks pregnant. On admission, her temperature was 38.7°C and her cervix was dilated. She aborted, spontaneously, shortly after her admission to the clinic. The maternal peripheral leukocyte count was 22,800 cells per mm$^3$, with 84.6% neutrophils. After a blood sample was taken for culture, treatment with intravenous gentamicin and penicillin was begun. Her condition improved rapidly.

This patient had no underlying disease, and her only previous pregnancy (3 years earlier) was uneventful, with delivery at full term. She had contact with a healthy household cat. She had no recent exposure to other animals or other persons with diarrhea, unpasteurized food products, or untreated water.

Gram staining of fetoplacental material revealed numerous curved gram-negative bacilli typical of *Campylobacter* spp. Blood was cultured in aerobic and anaerobic bottles with brain heart infusion broth. Fetoplacental material was inoculated onto defibrinated sheep blood agar and Skirrow selective medium (Oxoid). Plates were incubated in a microaerobic gas mixture containing 5% O$_2$, 10% CO$_2$, and 85% H$_2$ and in air at 37°C for 72 h. The admission aerobic blood culture and placenta cultures on nonselective media yielded a catalase-negative *Campylobacter* sp., but Skirrow selective medium did not. The organism was identified as *C. upsaliensis* according to the criteria described below (11). Follow-up blood cultures were negative. A fecal culture performed 3 days after abortion was negative for *Campylobacter* spp.

On physical examination, the 3-year-old household cat was found to be healthy and no gastrointestinal symptoms were observed. Rectal samples, taken from the cat 1 week after the patient's admission, were cultured on Skirrow selective medium and on antibiotic-free medium by a filtration method (12). The filter technique using defibrinated sheep blood agar yielded *C. upsaliensis*, but selective medium did not.

Gram-negative, motile, curved or spiral rods forming typical *Campylobacter* colonies on solid media were tested to determine biochemical and growth characteristics. Catalase activity was tested by using 20% H$_2$O$_2$ in a slide test (12) and by a sensitive capillary tube method (6). Tests were considered negative if gas bubbles were not formed within 30 min. The tests were run in triplicate. Each isolate was tested for hippurate and urea hydrolysis; H$_2$S production in ferrous sulfate-sodium metabisulfite-sodium pyruvate medium and triple sugar iron agar; nitrate reduction; susceptibility to nalidixic acid and cephalothin (30-μg disks); tolerance to 0.04% 2,3,5-triphenyltetrazolium chloride (TTC), 1.5% NaCl, and 1% glycine; growth at 25 and 42°C; and anaerobic growth in the presence of 0.1% trimethylamine-N-oxide hydrochloride (TMAO) by methods described previously (4, 10). Each test was run in duplicate, and the *C. upsaliensis* reference strain NCTC 11541 was included as a control in each test.

Susceptibilities to antibiotics were determined by the disk diffusion method of Bauer et al. (1). Isolates were serotyped for heat-labile antigens by the method of Lior et al. (7).

The whole-cell protein extracts of catalase-negative isolates, *C. upsaliensis* reference strains (NCTC 11541 and LMG 7533), and *C. fetus*, *C. jejuni*, and *C. coli* strains were prepared, and sodium dodecyl sulfate (SDS)-polyacrylamide gel electrophoresis was performed by using the procedure of Owen et al. (9). Numerical analysis of protein bands was performed as described by Kersters and De Ley (5) by using the SPSS program. The similarities between all pairs of traces were expressed by the Pearson product moment correlation coefficient (converted for convenience to a percent value).

The organism was catalase, hippurate, and urease negative and oxidase and nitrate positive. Growth was observed at 42°C but not at 25°C. No H$_2$S production occurred in iron-containing medium and triple sugar iron agar. TTC (0.04%) and NaCl (1.5%) inhibited growth, but glycine (1%) did not. Anaerobic growth in the presence of TMAO was not observed. The organism was susceptible to nalidixic acid and cephalothin. According to these criteria, the organism was identified as *C. upsaliensis*. All phenotypic characteristics of the cat isolate were identical to those of the human isolate.

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The organism was susceptible to ampicillin, chloramphenicol, tetracycline, erythromycin, gentamicin, tobramycin, cephalothin, and cefotaxime and resistant to streptomycin, trimethoprim, and vancomycin. Antimicrobial susceptibility patterns of the human and cat isolates were identical. None of the isolates were serotyped in antisera against the Campylobacter heat-labile antigens described by Lior et al. (7). Electrophoretic protein profiles of human and cat isolates were almost identical (Fig. 1). These isolates showed 92 to 94% similarity to the two reference strains of C. upsaliensis. The percent similarities between the electropherograms of C. upsaliensis isolates and C. fetus were 57, 74, and 70%, respectively.

The isolation of C. upsaliensis from our patient in the absence of other conventional pathogens implied a direct association of this organism with septicaemia and abortion. The only reported case of C. upsaliensis infection occurring during pregnancy was for a woman with a ruptured ectopic pregnancy; however, a causal association is not apparent (10).

The C. upsaliensis-negative stool culture of the patient might be attributed to the fact that the sample was taken 3 days after the onset of chemotherapy. The presence of diarrhea and fever, as well as the recovery of the organism from blood and placenta, however, suggested that the probable source of fetal infection was the maternal intestinal tract, from where bacteremia and placental localization proceeded. This proposed route and complications of infection also appear to be common in infections caused by other Campylobacter species during pregnancy (8, 13, 14). In this case, the potential route of transmission of infection was through exposure to a healthy household cat. Numerical analysis of protein profiles revealed that strains isolated from the patient and the cat were almost identical, implying that the household cat might be the source of infection. Several reports indicate the high prevalence of C. upsaliensis in healthy as well as diarrheic cats and dogs (2, 12). Patton et al. (10) reported cases of C. upsaliensis infection in humans who had contact with household dogs and a cat.

Our case report suggests that C. upsaliensis infection during pregnancy may have serious consequences and that this organism should be considered a potential pathogen for pregnant women, especially when there is a history of contact with animals.

REFERENCES


FIG. 1. Coomassie brilliant blue-stained SDS-polyacrylamide gel electropherograms of C. upsaliensis isolates and other Campylobacter species. Lanes: 1, C. coli; 2, C. jejuni; 3, C. fetus subsp. fetus; 4, C. upsaliensis LMG 7533; 5, C. upsaliensis NCTC 11541; 6, C. upsaliensis cat isolate; 7, C. upsaliensis human placental isolate; M, molecular size markers (sizes are indicated on the right in kilodaltons).