

Campylobacter fetus Septicemia with Concurrent Salpingitis

WILLIAM J. BROWN* AND ROBERT SAUTTER

Department of Pathology, Hutzel Hospital* and Department of Immunology and Microbiology, Wayne State University School of Medicine, Detroit, Michigan 48201

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Campylobacter fetus was isolated from the blood of a nonpregnant young woman who had a clinical diagnosis of salpingitis. A description of the isolate of *C. fetus* is given. An increasing awareness of human infections and capability of growing this microaerophilic organism should contribute to our understanding of the incidence and virulence of this bacterium.

Campylobacteriosis is an infectious disease of animals that is transmissible to man. The etiological agents are members of the genus *Campylobacter* (curved rod). This name was first proposed in 1963 by Sebald and Veron (17) and has now been accepted as the name for organisms formerly called *Vibrio fetus* (18).

C. fetus has long been associated with infectious abortions and infertility in animals. It was first isolated in 1909 from cattle (12), and in the following years the pathogenesis of this organism in animal abortions was confirmed by the extensive works of Smith et al. (19). *C. fetus* is now recognized as a major cause of infectious abortion in cattle and sheep and of reproductive disease in cattle (13).

Human infections are caused by *C. fetus* subsp. *intestinalis* or *jejuni*. Humans infected with these organisms usually exhibit sepsis, diarrhea, or neonatal meningitis (10, 15, 23). Approximately 100 human cases have been reported in the world since Vinzent et al. (21), in 1947, first confirmed human infections due to this organism. The very young and old, as well as individuals with chronic debilitating diseases or immunosuppression, are particularly susceptible to infection with *C. fetus* (1, 6). The majority of human infections have been reported in males, and 75% of all cases are in individuals older than 45 years (1). Frequently, human infections are associated with septicemia.

The first indication that vibrio-shaped organisms may be involved in infections of the human reproductive tract was ascertained by Curtis (4) from aborted-fetus smears. In a later review of 15 cases by King (11), three were associated with problems of pregnancy. In two cases of septicemia in nonpregnant females, the first associated with a large ovarian cyst and the second associated with hemolytic anemia, thrombocytopenia and an ovarian cyst were re-

ported (14). The frequency and importance of *C. fetus* in obstetrical and gynecological patients are unknown. The organism cannot be recovered and identified from a vaginal or cervical specimen in most laboratories unless it is predominant—a condition not likely to occur. When the organism is recovered, it is frequently from blood or some other source usually free from micrororganisms and therefore is relatively easily recovered in most microbiology laboratories. This paper describes a case in which a woman exhibiting signs and symptoms of acute salpingitis developed septicemia with *C. fetus* subsp. *intestinalis*. *C. fetus* has not been previously reported in a patient with salpingitis.

CASE REPORT

A 31-year-old woman was seen, in the emergency room, with the symptoms of 5 h of acute right-lower-quadrant abdominal pain and nausea. Her temperature was 98.6°F (37°C) and her blood pressure was 160/100. Five years previously, the patient had a left salpingectomy for ectopic pregnancy. Upon examination, it was found that the patient had a right adnexal tenderness, but no masses were detectable. Pelvic examination with a speculum revealed a thick, cheesy, white discharge. The leukocyte count of blood drawn at admission was 16,000. All other physical findings and laboratory data were within normal limits. The following day, her temperature was 100.2°F (37.88°C) in the morning and rose to 101.4°F (38.55°C) within 24 h after admission. Three sets of blood cultures were collected at this time, and the patient was then given gentamicin and ampicillin intravenously. The leukocyte count at this time was 20,400, with 68% segmented neutrophils and 5% band neutrophils. After 4 days, the patient was afebrile and the abdominal symptoms began to improve. She was discharged after 1 week of

hospitalization, with a final diagnosis of acute salpingitis.

MATERIALS AND METHODS

Culture techniques. Blood cultures were performed by inoculating 5 ml of blood in 50 ml of thioglycolate 135-C and in 50 ml of Trypticase soy broth (TSB; BBL, Cockeysville, Md.) for each culture. Three such cultures were collected over a 2-h period. Both types of bottles contained CO₂, and the TSB bottles were vented with filtered air. All bottles were incubated at 35°C and examined daily for visible evidence of growth. On day 2, a 0.1-ml sample was aspirated from each bottle, and smears were made for Gram staining. A sample of the TSB culture was subcultured to a chocolate agar medium (BBL), which was incubated in 5 to 10% CO₂ at 35°C and 80% relative humidity. The samples from the thioglycolate medium were subcultured to anaerobic blood agar plates (Scott Laboratories Inc., Richmond, Calif.) and incubated at 35°C for 48 h in a GasPak jar (BBL).

Organism identification. The isolate from the blood cultures was identified by standard procedures (22). Confirmation of identification was made at the Center for Disease Control, Atlanta, Ga.

Antimicrobial susceptibility test. Susceptibility studies were performed by the microtube dilution technique, using Mueller-Hinton broth. The isolate was grown in TSB until the turbidity was greater than the turbidity standard (0.5 McFarland nephelometer turbidity standard). The culture was then diluted in Mueller-Hinton broth until the turbidity matched that of the standard (ca. 10⁸ bacteria per ml). This suspension was further diluted 1:50 in sterile, distilled water to yield 2 × 10⁶ bacteria per ml. Five microliters of the suspension was added to each well containing a 100-μl solution consisting of antimicrobial agent diluted in Mueller-Hinton broth. This resulted in a final inoculum of bacteria

equivalent to 10⁵/ml or 10⁴/100 μl. The microtiter plates were incubated at 35°C in 5% CO₂ for 48 h.

RESULTS

Gram stains of the smears made from the three TSB blood cultures collected 48 h previously revealed slightly curved gram-negative bacilli, some of which were comma-shaped (Fig. 1). It took 72 h of incubation for development of mature colonies of this organism on chocolate agar and subsequently on blood agar plates incubated under CO₂ and at 35°C (Fig. 2). Prolonged incubation under these conditions with high humidity resulted in the surface colonies developing a more unbonate appearance and slightly spreading peripheral growth. The organism was tentatively identified as *C. fetus* in our laboratory on the basis of: a negative Gram reaction; curved, thin, bacillus morphology; a requirement for microaerophilic conditions; corkscrew motility; a positive catalase reaction; a positive oxidase test; failure to grow on MacConkey agar; nonhemolytic colonies on sheep or rabbit blood agar; failure to produce acid from the usual carbohydrates tested; negative reactions for methyl red, indole, or Voges-Proskauer reaction; and a positive nitrate test.

Confirmation of identification and subspecies determination were performed by R. Weaver at the Center for Disease Control. In addition to the above reactions, the isolate grew at 25°C and in Albimi broth with 1.0% glycine but not in the presence of 3.5% sodium chloride. The strain was identified as *C. fetus* subsp. *intestinalis*.

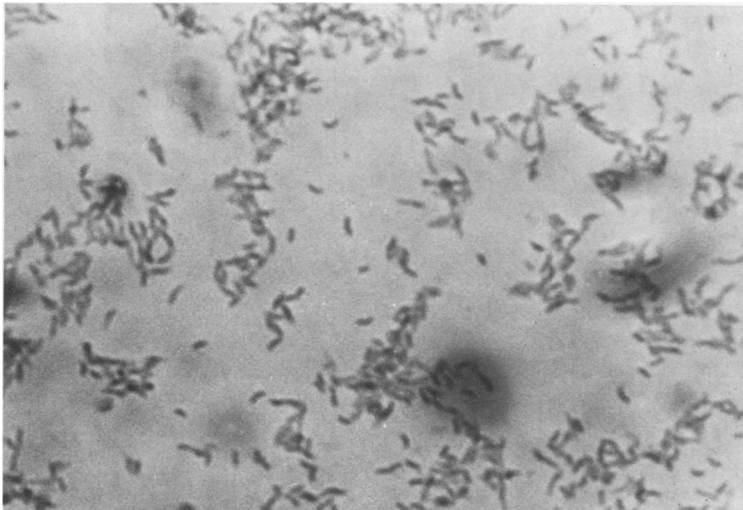


FIG. 1. Gram stain of a smear of *C. fetus* subsp. *intestinalis* isolated from a blood culture (magnification, ×1,000).

Quantitative susceptibility tests were performed by a microdilution technique done in triplicate. The minimal inhibitory concentrations of the agents tested are given in Table 1. The organism was found to be susceptible to the usual serum levels of all agents tested.

DISCUSSION

Microbiologists are isolating and identifying *C. fetus* more frequently from human infections (1, 6, 16). Greater awareness of this organism in human infections and the use of incubators with controlled CO₂ concentration and microaerophilic conditions have contributed to this. Although this organism has not been reported to cause salpingitis in humans, infection of the reproductive tract in animals is recognized. Abortions or fetal distress is the usual consequence. *C. fetus* subsp. *fetus* in cattle has been reported to be transmitted mainly through sexual contact (7). The organism colonizes the bulls and is transmitted to cows via

the semen. The source of human infections, however, has not been determined. *C. fetus* infections in humans are expressed in different forms. Frequently, there is a septicemic phase associated with the recognized infection (1, 20). The organism is slow growing and dysgonic in its growth properties. It is not readily isolated and recognized when it is mixed with other organisms. Therefore, the true incidence of *C. fetus* infections or just colonization in the intestinal or genitourinary system in humans remains to be determined. Evidence of infections with *C. fetus* could be obtained by using the serological tests recently described (2). However, the use of a selective medium to inhibit the overgrowth of other organisms is necessary before the human colonization information will be available.

The involvement of *C. fetus* in human salpingitis seems likely in this case. The clinical signs and symptoms of acute salpingitis were diagnosed at a greater than 99% accuracy based on the criteria of: low abdominal pain, adnexal uteri tenderness, vaginal discharge, fever, and vomiting (8). *Neisseria gonorrhoeae* is the most frequent cause of salpingitis or at least of initiation of infection (3, 5). However, two cultures of the cervix and rectum from our patient failed to exhibit any *N. gonorrhoeae* or other pathogenic organisms. The involvement of *C. fetus* in genital infections in nonpregnant menarchal-age women has not been generally recognized (1). When microbiological investigations for the etiological agent of salpingitis are performed, the culture technique should include techniques for the cultivation of *C. fetus* and other recognized agents causing genital tract infections (5).

Several reports of the antimicrobial susceptibility of *C. fetus* have been made (9, 14-16). However, these were based on disk agar diffusion tests, and the method of standardization of the procedure used for this dysgonic microaerophilic organism was not given. Serial dilution of four antibiotics in thioglycolate was reported by Willis and Austin, but details of the procedure were not included (23). Because of the variation of techniques used, conclusions concerning the antimicrobial susceptibility profile of *C. fetus* should await further work. Generally, the strains tested appear to be susceptible to most of the agents, as we found with our isolate. Our strain was shown to be susceptible to ampicillin and gentamicin with low minimal inhibitory concentrations for both agents. The patient responded well to these two antibiotics, and she has not relapsed in the 6 months since her acute infection.

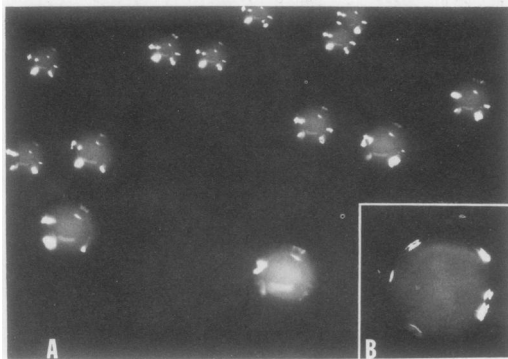


FIG. 2. Colonies of *C. fetus* grown for 72 h on 5% sheep blood agar at 6% CO₂ and 75% relative humidity. Isolated colonies varied from 0.8 to 1.8 mm. (A) $\times 6$ magnification; (B) isolated colony magnified $\times 8$.

TABLE 1. Minimal inhibitory concentration (MIC) of *C. fetus* subsp. *intestinalis* as measured in triplicate in Mueller-Hinton broth at 35°C and 5% CO₂

Antimicrobial agent	Dilution range ($\mu\text{g/ml}$)	MIC ($\mu\text{g/ml}$)
Ampicillin	0.2-16	≤ 0.2
Carbenicillin	8.0-512	≤ 8.0
Cephalothin	1.0-64	4.0
Chloramphenicol	0.5-32	1.0
Gentamicin	0.2-16	≤ 0.2
Kanamycin	1.0-64	≤ 1.0
Nitrofurantoin	8.0-512	≤ 8.0
Tetracycline	0.2-16	≤ 0.2
Tobramycin	0.2-16	0.5
Trimethoprim/sulfa	0.5/9.5-32/608	$\leq 0.5/9.5$

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