

Septicemia and Meningitis Caused by *Helicobacter cinaedi* in a Neonate

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***Helicobacter cinaedi* has been most frequently isolated from rectal swabs of homosexual men with proctocolitis. The microorganism is a normal intestinal inhabitant of hamsters. We report a case of septicemia and meningitis by *H. cinaedi* in a neonate whose mother cared for pet hamsters during the first two trimesters of her pregnancy. The isolate was detected after 3 days of incubation in a Bact/Alert pediatric blood culture vial and an enrichment broth culture of the cerebrospinal fluid. *H. cinaedi* should be added to the list of unusual fastidious organisms that cause sepsis and meningitis in the newborn.**

Helicobacter cinaedi, previously known as *Campylobacter*-like organism type I and *Campylobacter cinaedi*, has been isolated from rectal swabs of symptomatic homosexual men with proctocolitis and colitis (2, 7, 9). Five cases of bacteremia by *H. cinaedi* have been reported in homosexual men; three of the five men were human immunodeficiency virus (HIV) seropositive, whereas the remaining individuals were not tested for the presence of HIV antibodies (1, 6, 10). Rarely, *H. cinaedi* has been isolated from the blood and feces of women and children without known risk factors for HIV infection (11).

Since *H. cinaedi* has been isolated from the feces and intestines of healthy hamsters, this microorganism is considered to be a normal intestinal inhabitant of these common pets (3, 8). Gebhart and colleagues postulated that hamsters serve as an animal reservoir of *H. cinaedi* (3); we now report a case of *H. cinaedi* septicemia and meningitis in a newborn whose mother cared for pet hamsters during the first two trimesters of her pregnancy.

MATERIALS AND METHODS

Bacterial isolates. The blood culture isolate was recovered from the patient in a Bact/Alert Microbial Detection System pediatric blood culture vial (Organon Teknika Corp., Durham, N.C.). The cerebrospinal fluid (CSF) isolate was recovered from an enrichment broth containing Trypticase soy with 0.15% agar and x and v growth factors. The primary culture of CSF on agar-plate media (chocolate and blood) did not yield any growth after 3 days of incubation. Reference strains of *Campylobacter jejuni* and *Helicobacter pylori* (87-616) were isolated from patients in Oklahoma. *Helicobacter fennelliae* (ATCC 35684) was obtained from the American Type Culture Collection (Rockville, Md.), and the reference strain of *H. cinaedi* (92-354) was obtained from Marie Coyle (Seattle, Wash.).

Microbial characterization. The blood and CSF isolates were subcultured to heart infusion rabbit, chocolate, and Columbia sheep blood agars and incubated at 36°C in 5 to 10% CO₂. After 7 days of incubation, an inoculum from Columbia blood agar was used for determining biochemical properties and disk diffusion antimicrobial susceptibilities (2). Profiles of the fatty acids were obtained by gas-liquid

chromatography with the Microbial Identification System (MIS; MIDI Inc., Newark, Del.) as previously described (5). The isolate from the patient was harvested from 7-day cultures grown on blood agar in 10% CO₂. Fatty acid methyl ester derivatives of cellular fatty acids were analyzed and compared with the library entries of the MIS CLIN data base (Rev. 3.50 and Rev. 3.60).

RESULTS

Case report. A 3.9-kg female was born via spontaneous vaginal delivery at term to a 21-year-old gravida 3 white female. During the first and second trimesters of the pregnancy, the mother cared for pet hamsters. The hamsters were removed from the home early in the third trimester. Her pregnancy was only complicated by a mild and self-limited diarrheal illness during the third trimester of pregnancy. The mother had no sexual relationships with bisexuals and did not have multiple sexual partners. She had a negative history for sexually transmitted diseases. She had not received blood transfusions and had not used intravenous drugs.

The mother's labor and delivery of the child were uncomplicated. The healthy-appearing newborn went home with the mother 2 days after birth. The baby was well until 5 days of age, when she became irritable and developed an axillary temperature of 102°F. She was taken to Children's Hospital of Oklahoma, where she was found to be irritable but consolable. Her temperature was 38°C, but no other abnormalities were found on physical examination.

Her leukocyte count was 23,700 cells per mm³ consisting of 61% neutrophils, 18% bands, 2% lymphocytes, and 18% monocytes. Her CSF contained 10,000 leukocytes per mm³ (80% neutrophils and 20% monocytes) and 200 erythrocytes per mm³. The glucose concentration in the CSF was 24 mg/dl (peripheral blood glucose, 79 mg/dl), and the protein concentration in the CSF was 212 mg/dl. A gram-stained smear of the CSF revealed many leukocytes; no microorganisms were observed. Group B streptococcal polysaccharide was not detected in the urine or CSF by latex agglutination.

The neonate was hospitalized and given intravenous ampicillin (200 mg/kg per day) and cefotaxime (200 mg/kg per day). A urine culture obtained before the initiation of antibiotic treatment was sterile. A small gram-negative bacillus, later identified as *H. cinaedi*, was isolated from the single

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TABLE 1. Characterization of the isolate from the blood and CSF of a neonate and comparison with *Helicobacter* species^a

Parameter (unit)	Values for:			
	Patient's isolate	<i>H. cinaedi</i>	<i>H. pylori</i>	<i>H. fennelliae</i>
Growth				
At 25°C	0	0 (0)	0 (0)	0 (0)
At 36°C	+	+	+	+
At 42°C	0	0 (0)	0 (0)	0 (0)
Aerobic	0	0 (0)	0 (0)	0 (0)
Anaerobic	0	0 (0)	0 (0)	0 (0)
Test results				
Oxidase	+	+	+	+
Catalase	+	+	+	+
Nitrate	+	+	0	0
Motility	+	+	+	+
Antibiotic susceptibility^b				
Nalidixic acid	S	S (S)	R (R)	S (S)
Cephalothin	I	I (I)	S (S)	S (S)
Cellular fatty acids^c (%)				
C _{12:0}	5	8 (2)		3 (1)
C _{14:0}	18	20 (15)	37 (31)	10 (7)
C _{16:0}	34	30 (35)	6 (4)	28 (32)
C _{18:1 ω7c}	31	30 (27)	9 (11)	39 (37)
C _{18:0}	3	2 (5)	11 (12)	1 (4)
C _{12:0} 3-OH	2	2 (3)		
C _{14:0} 3-OH				3 (3)
C _{16:0} 3-OH	2	2 (6)	3 (3)	4 (4)
C _{18:0} 3-OH			7 (8)	

^a Data from the patient's isolate from our laboratory are compared with those from reference strains of *H. cinaedi* (92-354; Seattle), *H. pylori* (87-616; Oklahoma), and *H. fennelliae* (ATCC 35684). The results within parentheses are those reported by Lambert and colleagues (4) or others.

^b S, susceptible; R, resistant; I, intermediate.

^c The numbers refer to percentages of total whole-cell fatty acids. *H. pylori* also contains a major amount of C_{19:0} cyclopropane containing cellular fatty acids, and *H. fennelliae* contains approximately 10% C_{16:0} dimethyl acetal.

admission blood specimen and CSF specimen on day 3 of hospitalization. At this time, a repeat lumbar puncture revealed CSF containing 77 leukocytes per mm³ (40% neutrophils, 26% lymphocytes, 23% monocytes, and 11% macrophages) and 270 erythrocytes per mm³. The glucose concentration in the CSF was 31 mg/dl; and the protein concentration in the CSF was 160 mg/dl. No microorganisms were observed by Gram stain of the CSF, and the culture was subsequently sterile.

The newborn's antimicrobial regimen was changed to intravenous ampicillin and gentamicin (7.5 mg/kg per day), since the isolate was susceptible to both of these agents *in vitro*. She was treated with antibiotics for a total of 19 days and was discharged home with a normal physical examination.

Cervical and rectal cultures from the mother obtained 19 days postpartum did not grow *H. cinaedi*. The mother's serum obtained during the child's hospitalization was HIV negative.

Bacteriology. The microorganism isolated from this patient's blood and CSF produced flat, spreading, gray colonies. Microscopically, the organisms were wavy, gram-negative bacilli. They were spirally motile on examination by dark-field microscopy. The isolate grew best on Columbia

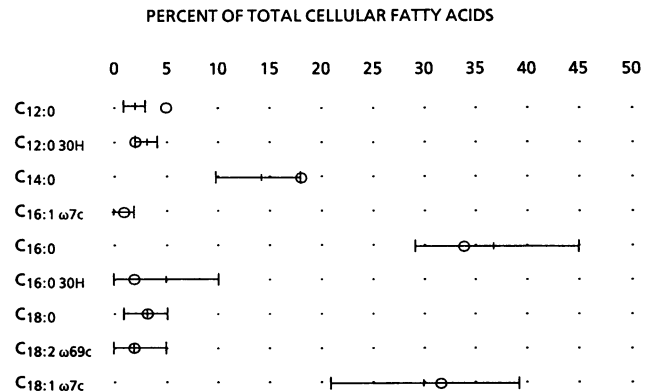


FIG. 1. Comparison of the mean cellular fatty acid composition of the patient's isolate (O), after three repetitions, with that of the library entry for *H. cinaedi* in the MIS system. Bars represent a window of ± 2 standard deviations around the mean value for the library entry.

blood agar and horse blood agar in a microaerophilic atmosphere containing 10% CO₂. Further studies were directed at comparison of the isolate with species of *Campylobacter* and *Helicobacter*, genera known to possess these general characteristics. In contrast to *Campylobacter jejuni*, the patient's isolate did not grow at 42°C, was not resistant to cephalothin, and maintained a slower growth rate. The biochemical characteristics of the isolate compared with those of three *Helicobacter* species are shown in Table 1. Unlike *H. pylori* and *H. fennelliae*, the patient's isolate reduced nitrates. *H. pylori* and *H. fennelliae* were susceptible to cephalothin, whereas the patient's isolate had intermediate susceptibility (zone size, 16 mm) to the cephalosporin.

The cellular fatty acid profiles of the isolate and *Helicobacter* spp. are also shown in Table 1. Like *H. cinaedi* and *H. fennelliae*, the patient's isolate was characterized by the absence of C_{19:0} cyclopropane, a constituent of *H. pylori* and *C. jejuni* (4). Additionally, the presence of C_{12:0} and significant amounts of C_{14:0}, C_{16:0}, and C_{18:1 ω7c} characterized *H. cinaedi*, *H. fennelliae*, and the patient's isolate. The patterns of hydroxy fatty acids distinguished the patient's isolate and *H. cinaedi* from the other *Helicobacter* spp. They contained C_{12:0} 3-OH and C_{16:0} 3-OH but not the C_{18:0} 3-OH or C_{14:0} 3-OH found in *H. pylori* and *H. fennelliae*, respectively. *H. fennelliae* had lower percentages of C_{14:0} and C_{16:0} and a greater percentage of C_{18:1 ω7c} than the patient's isolate did. The similarity index to *H. cinaedi* in the MIS system CLIN library (Rev. 3.50) was 0.362, and that with Rev. 3.60 was 0.390. Figure 1 shows a further comparison of the cellular fatty acid composition of the patient's isolate with that for the library entry of *H. cinaedi* in the MIS. The determination of each fatty acid was within ± 2 standard deviations of the mean, except that C_{12:0} was slightly higher for our isolate than for the MIS library entry of *H. cinaedi*.

DISCUSSION

Comparison of the biochemical features and the cellular fatty acid profiles of our patient's isolate with those of related organisms identified the patient's isolate as *H. cinaedi* (2, 4). A practical clue to the identification of our isolate as *H. cinaedi* was the intermediate zone (16 mm) of inhibition that surrounded a 30- μ g disk of cephalothin (2).

Gas-liquid chromatography was also particularly useful in establishing identification of the isolate, supporting the conclusions of Lambert et al. (4), who studied gas-liquid chromatography as a tool in differentiating several *Campylobacter* and *Campylobacter*-like species. The somewhat lower index of similarity (0.390) for our isolate in the MIS may be due to a limitation involving difficulty procuring a large enough number of strains to build a good data base for such unusual organisms.

In children, *H. cinaedi* has been previously isolated only from the blood of a previously healthy 2-year-old male and the feces of two healthy female children (11). This is the first report of *H. cinaedi* causing sepsis and meningitis in a newborn. Our patient's clinical course was relatively benign despite having 10,000 leukocytes in the CSF before administration of antibiotics. The patient's only presenting symptoms were mild fever and irritability. Her 19-day hospital course was uncomplicated, and at the time of hospital discharge she had a normal neurological exam.

The mother of our patient was healthy and HIV seronegative. She was exposed to hamsters during the first and second trimesters of her pregnancy. Since *H. cinaedi* has been identified as a normal intestinal inhabitant of these rodents (3, 8), we suggest that the pet hamsters served as a reservoir for the transmission of this microorganism to the patient's mother. It is unknown whether the mother's diarrheal illness during the third trimester was caused by *H. cinaedi*. The newborn most likely became colonized with *H. cinaedi* during the birth process; however, we were not able to isolate the microorganism from the mother's feces or cervix during the child's hospitalization.

H. cinaedi should be added to the list of agents that cause sepsis and meningitis in newborns. Because this microorganism is fastidious, physicians should consider *H. cinaedi* as a possible pathogen in neonates who are mildly ill, who have high concentrations of neutrophils in their CSF, and have sterile CSF cultures.

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