

This 18-year-old male presented to the outpatient medical clinic for evaluation of diarrhea and abdominal discomfort. The patient first noted mild abdominal discomfort and three loose bowel movements per day 1 week prior to evaluation. Two days prior to evaluation he noted intermittent, crampy periumbilical abdominal pain. He denied drinking well water, fever, blood in the stool, relation of the pain to meals, dysuria, or hematuria.

On examination, the patient was afebrile and had normal vital signs. The abdominal examination was notable for mild lower abdominal tenderness. The fecal examination demonstrated a greenish, watery stool that was negative for occult blood.

Laboratory evaluation included a normal white blood cell count, hematocrit, and platelet count. Examination of the feces microscopically was remarkable for the presence of white blood cells. The organism causing his illness is shown in Fig. 1 (Gram stain) and 2 (growth on special medium).

1. On the basis of the laboratory findings, what is the likely etiology of this patient's diarrhea? Is the finding of white cells in the feces consistent with the recovery of this organism? Explain your answer.

2. What special laboratory conditions are necessary to recover this organism?

3. What is the epidemiology of this organism? What interventions can prevent its spread?

4. Although the patient has evidence of local invasion in the intestinal tract with this organism, bacteremia due to this organism is unusual. Explain this observation.

5. What special problems have been described with infections with this organism in HIV-infected individuals?



Figure 1

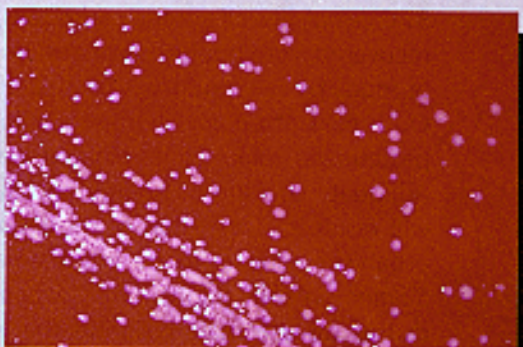


Figure 2

Case Discussion

1. Both *Vibrio* and *Campylobacter* spp. are slightly curved, gram-negative rods that cause diarrhea (Fig. 1). The pathogenesis of the most important *Vibrio* species, *Vibrio cholerae*, is due primarily to the production of an exotoxin, cholera toxin, which causes a secretory diarrhea. The stools of patients with severe cases of cholera have a "rice water" appearance. Because of the secretory, noninflammatory nature of the diarrhea, white blood cells are rarely seen in the feces of patients with cholera. *Campylobacter* spp. cause an invasive diarrhea distinguished by the presence of white blood cells in the stool. The diarrhea seen in this patient is consistent with a *Campylobacter* infection, and *Campylobacter jejuni* was isolated from his stool (Fig. 2).

2. It is important to remember that the aerobic fecal flora consists of approximately 10^7 to 10^9 CFU/g of feces and that finding an enteric pathogen which may represent only a small fraction of this flora is akin to trying to find a needle in a haystack. Selective media, such as Hektoen and MacConkey agar, used for the isolation of *Salmonella* and *Shigella* spp. from feces do not support the growth of *Campylobacter* spp. Therefore, several selective media have been developed for the isolation of *Campylobacter* spp. To further complicate matters, *Campylobacter* spp. are microaerophilic organisms, and so culture conditions which will support their growth must be used when attempting to isolate them. Finally, *C. jejuni*, the most frequently recovered *Campylobacter* species, grows optimally at 42°C. Many laboratories inoculate fecal specimens onto campylobacter selective agar and incubate these plates at 42°C under microaerophilic conditions in an attempt to isolate these organisms. This approach is problematic since other *Campylobacter* spp. either fail to grow on certain types of campylobacter selective agar or cannot grow at 42°C. Alternative methods are available for the isolation of these species.

3. *C. jejuni*, like all enteric pathogens, is spread by the fecal-oral route. It is frequently recovered from poultry carcasses. Improperly cooked poultry or cross-contamination of foods by raw poultry is postulated to be the most important source of infection. Outbreaks of *Campylobacter* infection have also followed the consumption of non-pasteurized milk. Contaminated water is an infrequent vehicle for this infection. Adequate cooking of poultry and avoidance of cross-contamination of other foods will result in prevention of most *Campylobacter* cases. The infectious dose for this organism appears to be intermediate between those for *Shigella* spp. (low) and *Salmonella* spp. (high). Like *Salmonella* and *Shigella* spp., it is an organism which causes disease mainly during the warm-weather months. One of the interesting observations concerning this organism is that the peak incidence of infection is in infants (<1 year old) and adolescents and young adults (15 to 29 years old). It is probably the most frequent cause of bacterial gastroenteritis in college students in the United States, with isolation rates on certain campuses as high as 15% in individuals with diarrhea.

4. *C. jejuni* was locally invasive in this patient as evidenced by the presence of white blood cells in his feces. Like *Shigella* spp., this organism rarely causes bacteremia in the immunocompetent host. The most likely reason for this is that this organism, unlike *Salmonella* spp., does not survive within phagocytic cells. It is either locally ingested and killed by phagocytes in the intestinal wall or carried by lymphatic drainage to the Peyer's patches, where it is killed. Occasional cases of *C. jejuni* bacteremia occur, but most are transient because the reticuloendothelial system is able to eliminate this organism from the bloodstream.

5. Campylobacter-associated diarrhea and bacteremia are both more common in HIV-infected individuals, especially those with a CD4 count of $<200/\mu\text{l}$. Campylobacter infections are problematic in HIV-infected individuals for two reasons. First, as many as 20% will develop chronic diarrhea with this organism. The second problem directly contributes to the first. In some HIV-infected patients treated for campylobacter-associated diarrhea with either oral quinolone (ciprofloxacin) or macrolide (erythromycin) antimicrobial agents, drug resistance has developed in vivo. The emergence of drug-resistant isolates during therapy has resulted in treatment failures and/or disease relapse. This in combination with immune dysfunction may result in the establishment of chronic diarrhea.

References

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2. Molina, J. M., I. Casin, P. Hausfater, E. Giretti, X. Welker, J. M. Decazes, V. Garrait, P. Lagrange, and J. Modai. 1995. *Campylobacter* infections in HIV-infected patients: clinical and bacteriological features. *AIDS* 9:881–885.