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Cryptosporidiosis in Patients at a Large Teaching Hospital

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In 1984, all stool samples submitted to a microbiology laboratory (n = 2,197) from a predominantly hospital-based population were examined for *Cryptosporidium* oocysts after Ziehl-Neelsen staining, but only 0.5% were positive. We suggest that in low-incidence areas, individual laboratories examine stool samples for this organism only in immunosuppressed patients and those in whom symptoms persist.

Cryptosporidium is a coccidian parasite which was recognized as an infecting agent in animals as long ago as 1907, when Tyzzer described the infection in mice (11). Little interest was shown in cryptosporidiosis until the last decade, however, because of the lack of association with disease. In the 1970s, *Cryptosporidium* was described as a cause of diarrhea in calves (8), and the first case of human cryptosporidiosis was recorded (7). Since then, a large number of cases have been seen in both immunocompromised and immunocompetent patients (Editorial, Lancet i:492–493, 1984), and the disease has been described as a zoonosis (10). Recent reports, however, indicate that infection is not necessarily associated with animal contact (4), and there is evidence for human cross-infection (1, 6). The present study was undertaken to assess the usefulness of routine stool examination for *Cryptosporidium* oocysts and to determine the clinical symptoms associated with infection with this organism.

In 1984, every stool sample received in our microbiology laboratory for culturing was examined for *Cryptosporidium* oocysts with a modified Ziehl-Neelsen stain (3). Stool smears were prepared by ether sedimentation by the technique of Ritchie (9) and examined, on the average, for about 7 min by oil immersion microscopy. The majority of stool samples were collected in the hospital to investigate gastrointestinal symptoms developing in inpatients or in persons attending the outpatient department, but some were collected by general practitioners (4%) and Newcastle University Health Service (10%). After dilution with 5 volumes of maximal-recovery diluent, all stool samples were also cultured for *Campylobacter* spp. (horse blood agar containing cephalothin [30 μg/ml]), *Shigella* spp., *Salmonella* spp., *Plesiomonas* spp. (deoxycholate-citrate agar, Hektoen enteric agar, and Selenite-F Enrichment [B8L Microbiology Systems]), *Yersinia enterocolitica* and *Aeromonas* spp. (*Yersinia* selective agar base) and, in children under 2 years old, enteropathogenic *Escherichia coli* (horse blood agar). All media, except Selenite-F Enrichment, were obtained from Oxoid Ltd. Plates were incubated for 24 h at 37°C, except for *Campylobacter* plates (42°C for 48 h). Isolates were identified by the API system and by serotyping when appropriate. Stool samples were also examined for parasite cysts and worms by microscopy of unstained smears.

All inpatients were seen on the ward, and symptoms were noted; outpatients completed a postal questionnaire. Stool samples were processed immediately upon receipt in the laboratory. When possible, further samples from the patients themselves or from close contacts were also examined. Stool samples from a group of 60 healthy volunteers constituted the control group.

In 1984, 2,197 stool samples were submitted for bacteriological analysis, but only 12 (0.5%) contained *Cryptosporidium* oocysts. Other stool isolates are shown in Table 1. None of the stool samples from healthy volunteers contained *Cryptosporidium* oocysts.

The symptoms associated with *Cryptosporidium* infection are shown in Table 2. All patients complained of diarrhea, but the stools from one patient also contained *Campylobacter* spp., which may have been responsible. Stool samples from patients with diarrhea often contain more than one pathogen (5). Of the 12 patients with cryptosporidiosis, 5, all of whom were children, required hospital admission. In 7 patients, the diarrhea was associated with anorexia, nausea, or vomiting, and in 5 patients, it was associated with severe abdominal pain. In one case, the pain was of sufficient severity for the child to be admitted to the hospital with suspected appendicitis. In general, children had more severe symptoms than adults, in agreement with the findings of other workers (2). Two young adults had mild illnesses lasting only 4 days, but in the remaining patients, the diarrhea lasted for 5 to 15 days.

In a study in Bristol, United Kingdom (4), there was a 5% isolation rate from stool samples collected from patients seen by general practitioners, and in the present study, there was a disproportionate number of isolations from stool samples collected from patients attending Newcastle University Health Service (5 of 229). Only two patients had a history of direct animal contact; the roles of milk, water, and food contamination in the transmission of *Cryptosporidium*

TABLE 1. Enteric pathogens (and potential pathogens) isolated in 1984 from 2,197 stool specimens

Pathogen	No. (%) isolated
Campylobacter spp.	47 (2.1)
Aeromonas hydrophila	44 (2.0)
Salmonella spp.	29 (1.3)
Yersinia enterocolitica	14 (0.6)
Enteropathogenic *Escherichia coli*	13 (0.6)
Plesiomonas shigelloides	2 (0.1)
Cryptosporidia	12 (0.5)
Giardia lamblia	9 (0.4)
Entamoeba histolytica	7 (0.3)
Various helminths	5 (0.2)

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TABLE 2. Clinical features of patients excreting cryptosporidium oocysts

Patient	Age, sex	Symptoms	Length of illness (days), patient status	Comment
1	2 yr, M	Diarrhea, vomiting	13, Admitted for severe vomiting and diarrhea	*Campylobacter* spp. also cultured, treated with erythromicin
2	4 yr, M	Anorexia, diarrhea	9, Required hospital admission	Required intravenous fluids
3	6 yr, F	Diarrhea, vomiting, abdominal pain	5, Required hospital admission	Admitted because of suspected appendicitis, required intravenous fluids
4	6 yr, M	Diarrhea, vomiting	7, Required hospital admission	All family members had diarrhea and vomiting
5	8 mo, F	Diarrhea, vomiting	7, Outpatient	
6	12 yr, M	Diarrhea, abdominal pain	9, Outpatient	
7	14 yr, F	Diarrhea, abdominal pain, vomiting	10, Required hospital admission	Two siblings and pet dog had diarrhea, but *Cryptosporidium* oocysts were not found
8	20 yr, M	Diarrhea	4, Outpatient	Given loperamide
9	21 yr, M	Diarrhea	15, Outpatient	Animal contact—working with sheep ileum
10	21 yr, M	Diarrhea, abdominal pain	13, Outpatient	Given loperamide
11	22 yr, M	Diarrhea	4, Outpatient	Roommate had *Salmonella typhimurium* infection
12	26 yr, F	Diarrhea, abdominal pain, nausea	11, Outpatient	Systemic lupus erythematosus, on steroids

infection to humans have yet to be elucidated. Geographical differences in distribution also remain unexplained.

Although the technique for *Cryptosporidium* isolation is simple, it is also time-consuming and proves an unrewarding task for technical staffs. As so few positives were found during 1 year of careful routine searching, we recommend stool examination for *Cryptosporidium* oocysts only in immunosuppressed patients or those with severe or prolonged unexplained diarrhea.

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