Letters to the Editor

Low Incidence of Concurrent Enteric Infection Associated with Sporadic and Outbreak-Related Human Cryptosporidiosis in Northern Ireland

Human cryptosporidiosis has emerged as an important gastrointestinal infection in the 1990s due to the ingestion of contaminated water and foodstuffs containing the protozoan parasite Cryptosporidium spp. (4, 9). This pathogen has particular clinical significance for immunocompromised persons, including AIDS patients and cancer patients receiving toxic chemotherapeutic drug regimens (4, 9). Concern relating to this parasite is founded on three parameters: (i) the causal agent of this infectious disease can be transmitted through contaminated water and food, (ii) when ingested, the agent is capable of causing a high degree of morbidity in healthy populations and mortality in vulnerable populations, and (iii) there is no effective antimicrobial treatment to eradicate this agent from the gastrointestinal tract in symptomatic individuals. To date, there have been very limited data describing the frequency and microbiological etiology of mixed enteric infections in the developed world, where an additional enteric pathogen has been isolated along with Cryptosporidium parvum. Hence, it was the aim of our investigation to retrospectively determine the frequency of mixed enteric infections with C. parvum and to determine the coinfecting organism in both sporadic and outbreak-related cryptosporidiosis.

In 2000 and 2001, the Northern Ireland Public Health Laboratory processed 9,165 and 10,832 fecal specimens, respectively, which were from symptomatic patients and had been submitted mainly by general practitioners as well as from hospital wards. From these, Cryptosporidium sp. was detected by employment of the modified Ziehl-Neelsen acid-fast staining technique in 255 (2.8%) and 191 (1.8%) cases in 2000 and 2001, respectively, with the majority of cases involving children. The age distribution of cryptosporidial cases in 2000 was 46.7% for patients of <5 years, 18.4% for patients from 6 to 10 years, 9.8% for patients from 11 to 20 years, and 25.1% for patients of >20 years. In 2001, the age distribution was 34.0% for patients of <5 years, 16.2% for patients from 6 to 10 years, 6.3% for patients from 11 to 20 years, and 43.5% for patients of >20 years. During these 2 years, there were three waterborne outbreaks of cryptosporidiosis, as previously described (6). Correcting for the outbreaks, the prevalence of sporadic cases during this time was 2.0% (183 of 9,165) and 1.4% (147 of 10,832) for 2000 and 2001, respectively. In addition to undergoing conventional cryptosporidial microscopic analysis, all fecal specimens were concurrently examined for Campylobacter spp., serotypes of Salmonella enterica, Shigella spp., Escherichia coli O157:H7, and Yersinia enterocolitica, in accordance with previously published methodologies (2). In addition, fecal specimens were analyzed for Clostridium difficile by employment of the Oxoid Toxin-A kit in accordance with the manufacturer’s instructions (Oxoid Ltd., Basingstoke, England) and for other parasitic ova and cysts on request by the attending physician. The frequency and distribution of concurrent enteric infections with Cryptosporidium spp. are shown in Table 1, while the prevalence of bacterial fecal pathogens in stool specimens which were negative for Cryptosporidium spp. is shown in Table 2. Overall, in 446 episodes of cryptosporidiosis in the same number of patients over this 2-year period, there was 2.0% coinfection with another enteric pathogen and C. parvum, where Campylobacter sp. accounted for the most frequently isolated copathogen (1.1%; 5 of 446), followed by Salmonella (0.45%; 2 of 446) and others (0.45%; 2 of 446). Similarly, the Intestinal Infectious Disease study in England demonstrated 2.6% (1 of 39) coinfection with Campylobacter sp. and 2.6% (1 of 39) coinfection with Giardia lamblia (Giardia duodenalis) (2). This study also demonstrated a significantly higher incidence of cryptosporidiosis in rural areas than in urban areas and a higher incidence in the north of England than in the Midlands and the south of England. In addition, there has been a previous association between Cryptosporidium and Campylobacter infection in a waterborne outbreak in the north of England (5).

The occurrence of mainly single-pathogen infection (98%) is of interest in trying to elucidate the potential reservoirs of this parasite in the local context. The three waterborne outbreaks produced only two cases of concurrent infection with an additional pathogen (Table 1). Furthermore, in all coinfection cases, with the exception of the patient with the positive C. difficile toxin assay, none of the patients presented previously with a positive fecal specimen of the coinfecting organism. Although these outbreaks were associated with the contamination of final drinking water with animal and human feces, no other enteric pathogen was associated with the outbreaks. As animal feces and human sewage have previously been shown to be heavily contaminated with enteric pathogens (3, 7), as water has been shown to be an important vehicle in

<table>
<thead>
<tr>
<th>Year and type of infection</th>
<th>No. of cases</th>
<th>Other enteric pathogen isolated</th>
<th>Age (yr) of patient with concurrent infection</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
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<td></td>
<td></td>
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<tr>
<td>Sporadic</td>
<td>183</td>
<td>Campylobacter sp.</td>
<td>1</td>
</tr>
<tr>
<td>Campylobacter sp.</td>
<td>4</td>
<td>Serovar</td>
<td></td>
</tr>
<tr>
<td>Salmonella enterica</td>
<td>2</td>
<td>Typhimurium</td>
<td></td>
</tr>
<tr>
<td>Other enteric pathogen</td>
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<td>S. enterica</td>
<td>20</td>
</tr>
<tr>
<td>Giardia lamblia</td>
<td>9</td>
<td>Enteritidis</td>
<td></td>
</tr>
<tr>
<td>Outbreak-related</td>
<td>72</td>
<td>Campylobacter sp.</td>
<td>6</td>
</tr>
<tr>
<td>2001</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Sporadic</td>
<td>147</td>
<td>Campylobacter sp.</td>
<td>1</td>
</tr>
<tr>
<td>Campylobacter sp.</td>
<td>2</td>
<td>Serovar</td>
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<tr>
<td>Other enteric pathogen</td>
<td>2</td>
<td>S. enterica</td>
<td></td>
</tr>
<tr>
<td>Giardia lamblia</td>
<td>71</td>
<td>Enteritidis</td>
<td></td>
</tr>
</tbody>
</table>

The data suggest that coinfections are more common in waterborne outbreaks than in sporadic cases but are not a significant source of infection in the latter. Coinfections were not detected in sporadic cases of cryptosporidiosis in England during this period (2), highlighting possible differences in the reservoirs of these parasites in different geographical regions. Clarification of the role of Campylobacter spp. in the transmission of cryptosporidiosis is of particular importance in the humid climate of Scotland, where C. parvum cases are common in summer months coincident with Campylobacter sp. infections (10). This may be an important area for future research to elucidate the potential reservoirs of Cryptosporidium and Campylobacter spp. in human cryptosporidiosis.

TABLE 1. Prevalence and etiology of mixed enteric infections associated with sporadic and outbreak-related cases of human cryptosporidiosis

- Cryptosporidium spp.
- Salmonella spp.
- Shigella spp.
- Escherichia coli
- Yersinia enterocolitica
- Campylobacter spp.
- Salmonella enterica
- Typhimurium
- Giardia lamblia
- Enteritidis
- Clostridium difficile

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the transmission of viable oocysts to humans (11), and as chlorination has been shown to be inefficient as an effective disinfection process against *C. parvum* (8), enteric pathogens in animal and human fecal material contaminating water may be eliminated by residual chlorine, with the exception of cryptosporidial oocysts. Our coinfection data are in marked contrast to those for cryptosporidial infection in underdeveloped and developing countries, where coinfection with other enteric pathogens is common. In Nepal, Sherchand and Shrestha (12) reported a coinfection rate of 13% with other enteric pathogens, whereas Okafor and Okunji (10) reported a coinfection rate of 16.7% in Nigeria. In Egypt, Abaza et al. (1) demonstrated a significant association between mixed infections with *G. lamblia* and *C. parvum* in immunocompromised patients.

In conclusion, individuals with symptomatic cryptosporidiosis have a low probability (2%) of being coinfected with a secondary enteric pathogen locally. This probably reflects the fact that in an urban western European population with a chlorinated water supply, there is less overlap between the risk factors of *Cryptosporidium* and those of the other enteric pathogens.

REFERENCES


John E. Moore*  
Lester Crothers  
B. Cherie Millar  
Elizabeth Crothers  
Paul J. Rooney  
Northern Ireland Public Health Laboratory  
Department of Bacteriology  
Belfast City Hospital  
Belfast BT9 7AD, Northern Ireland  
United Kingdom  

Lihua Xiao  
Division of Parasitic Diseases  
Centers for Disease Control and Prevention  
Atlanta, Georgia 30341  

James S. G. Dooley  
Colm J. Lowery  
School of Health and Life Sciences  
University of Ulster  
Coleraine  
Co. Londonderry BT52 1SA, Northern Ireland  
United Kingdom  

*Phone: 44 (28) 9026 3554  
Fax: 44 (28) 2589 2887  
E-mail: jemoore@niphl.dnet.co.uk