

PUBLIC HEALTH

The cryptic nature of cryptosporidiosis

Epidemiology: Cryptosporidiosis is an acute, self-limiting diarrheal disease caused by the parasite *Cryptosporidium*. Dormant oocysts are shed in the feces of infected animals and humans and are present in 65%–97% of North American surface waters.¹

Once ingested, the oocysts release sporozoites upon exposure to bile acids in the small intestine, where they penetrate epithelial cells. Infected people can present with severe, watery diarrhea, but they may be asymptomatic. Serologic surveys indicate that about 80% of North American adults have had cryptosporidiosis, but most may not have known it.² Disease severity depends on the host (concurrent infection, malnutrition, immunosuppression), agent (genotypic strain) and environmental (dose of exposure) factors. Once thought to be a rare, opportunistic infection, cryptosporidiosis is now recognized as a common cause of childhood diarrhea worldwide, accounting for 20% of all cases in developing countries.³

Initial reports of cryptosporidiosis in humans in the early 1970s associated the disease with immunosuppression; cell-mediated responses are essential for preventing and resolving the disease, which can be devastating for immunocompromised patients, in whom voluminous watery diarrhea leads to electrolyte imbalance. Subsequent reports, however, have shown that the disease predominantly affects neonatal animals and young, immunocompetent humans (most often aged 1–5 years).³ *Cryptosporidium* sporozoites possess surface lectins that attach to specific carbohydrates on the intestinal mucosa. The immature intestinal flora, immune response and diet of the young likely predispose them to infection.

Cryptosporidium species have been identified on the basis of host specificity, oocyst morphology and infection site. *C. parvum* is the most widespread and important cause of infection in mammals. Two main genotypes have been identified: a bovine form that infects both animals and humans, and a human genotype that is restricted to humans.

A recent study of fecal samples of asymptomatic Canadian farm animals suggested that the *Cryptosporidium* parasite is present in about 20% of cattle, sheep and horses, and in 10% of pigs.⁴ The burden of the disease and the potential for watershed contamination varies seasonally, increasing with lambing and calving activity and during peak rainfalls or farm waste production. A 1996 study of Canadian drinking water supplies found *Cryptosporidium* oocysts in 6.1% of 164 samples of raw sewage, 4.5% of 1173 samples of untreated drinking water and 3.5% of 423 samples of treated drinking water.⁵

Transmission is by the fecal–oral route through hand contact with the stool of infected humans or animals or with any surfaces contaminated with stool, and through ingestion of contaminated food or water. Documented outbreaks have occurred in day-care centres and swimming pools, and they have also been caused by municipal water supplies. This spring's outbreak in North Battleford, Sask., is the most recent example of infection through the water supply. People at increased risk include child-care workers, diaper-aged children attending day-care centres and people exposed to human feces by sexual contact.

Clinical management: Cryptosporidiosis became a notifiable disease in January 2000. There were 563 reported cases in Canada in 2000⁶; suspected cases should be reported promptly to the medical officer of health. The symptoms of watery diarrhea, stomach cramps and mild fever usually appear 2–10 days after infection. Each generation of parasites matures in as little as 12–14 hours, rapidly colonizing the intestinal tract and triggering a strong immune response in the immunocompetent host. Diagnosis is generally made by the identification either of oocysts in fecal smears using appropriate stains or of *Cryptosporidium* antigen in stool using an enzyme-linked immunosorbent assay. Treatment is supportive, with an emphasis on oral rehydration. Symptoms wax and wane but usually remit within 30 days. Asympto-

matic carriers can transmit the infection to others. Once infected, people can shed the oocysts in their stool for months. Outside the body the oocysts can remain infectious for 6–8 months.

Prevention: Chemical disinfectants (e.g., chlorine) are ineffective against oocysts. Alum and sand filtration reduce the number of oocysts, and seem to reduce their viability, but they do not eliminate them.⁷ Only water filters capable of removing particles less than 1 µm in diameter can reliably remove *C. parvum*; this includes reverse-osmosis filters and 1-µm filters rated as “absolute.”⁸ Boiling water for 1 minute destroys the oocysts. Infected individuals should wash their hands frequently, especially before preparing food or after going to the toilet, and avoid close contact with anyone with a weakened immune system. Individuals with diarrhea should refrain from using public bathing areas for at least 2 weeks after the diarrhea has resolved. — *Erica Weir, CMAJ*

References

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