

# Ubiquity of the water-borne pathogens, *Cryptosporidium* and *Giardia*, in KwaZulu-Natal populations

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## Abstract

The prevalence of the diarrhoea disease caused by the water-borne pathogens *Cryptosporidium* and *Giardia* in KwaZulu-Natal, was determined from pathology laboratory data. *Cryptosporidium* and *Giardia* were found to be endemic in KwaZulu-Natal with laboratory-confirmed incidences ranging from 2.9 to 3.7% and 2.9 to 3.0% respectively of diarrhoea samples submitted for protozoan parasite analysis. Increases in the number of samples submitted for *Cryptosporidium* or *Giardia* analysis were independent of the actual incidence of either protozoan pathogen. Female and male patients tested for cryptosporidiosis had similar positive percentages while giardiasis was more prevalent in female patients. *Cryptosporidium* and *Giardia* prevalence in children under 5 years indicated that *Cryptosporidium* was most prevalent (39.3%) in the <1 year age group while *Giardia* was most prevalent in the 3 to 4 year age group (38.5%). A low percentage of *Cryptosporidium* and *Giardia* positive cases were recorded in symptomatic (4.5% and 5.3% respectively) and asymptomatic (2.4% and 0.8% respectively) HIV patients. The incidence of *Cryptosporidium* and *Giardia* did not appear to correlate (Pearson's correlation test) with climatic factors such as rainfall, season or year, possibly indicating that water-borne transmission is not the predominant route and other factors such as personal hygiene, potable water supply, sanitation and education probably have a more significant impact.

## Introduction

Inadequate water supply and sanitation are largely responsible for more than 800 m. estimated cases of diarrhoeal disease and 4.5 m. associated deaths in developing countries every year (Esrey et al., 1990). In South Africa more than 7 m. people (approximately 17% of the population) do not have access to an adequate potable water supply (Dept. Water Affairs and Forestry, 1999) and nearly 21 m. (54%) lack basic sanitation (Dept. Water Affairs and Forestry, 1996) that further highlights the potential of infection by waterborne disease. At present updated figures for households with basic sanitation are not available, but tools are being developed to monitor and evaluate the implementation of sanitation (Crowder, 1999). Although there are many causes of diarrhoea, the enteric protozoa *Cryptosporidium parvum* and *Giardia lamblia* have been recognised as important causes of both outbreak-related and sporadic diarrhoea in humans (Casemore, 1990). Their major means of transmission is the faecal-oral route (person-to-person) while water and zoonotic transmission are also of importance and *Giardia* has been reported to be sexually transmitted (Phillips et al., 1981). Person-to-person transmission, particularly involving children and cross infection from patient-to-patient and between patients and staff in hospitals is common (Casemore et al., 1997). Zoonotic exposure occurs during farming of livestock particularly during the lambing and calving seasons, educational trips to farms and livestock markets and during backpacking excursions (Kreier and Baker, 1987; Casemore, 1990). Companion animals, particularly cats and dogs, have occasionally been implicated in human cryptosporidiosis (Casemore et al., 1997). Cryptosporidiosis and giardiasis have

emerged as important causes of travelers' diarrhoea suggesting a common epidemiology involving contaminated water or food and poor hygiene practices (Fayer and Ungar, 1986; Casemore, 1990).

The survival of *Cryptosporidium* oocysts in animal and human faeces is highlighted by the fact that 60% of oocysts were non-viable after 176 d. Once in a receiving body of water (e.g. river) the die-off rate increases dramatically as the length of time *Cryptosporidium* oocysts or *Giardia* cysts survive in water is dependent on the temperature. After 176 d, 96% of oocysts stored in water in a laboratory flow-through system at room temperature were non-viable (Robertson et al., 1992). *Giardia* cysts have survived at least 77 d in water at less than 10°C whilst above 20°C, cyst viability decreased after 3 d storage (DeRegnier et al., 1989). However, high temperatures (above 45°C) render (oo)cysts in water non-infectious (DeRegnier et al., 1989; Fayer, 1994). High-risk categories for infection by both protozoa include young children (< 5 years) and immuno-compromised patients (Current and Haynes, 1983). In South Africa 11 out of 110 children who were infected with cryptosporidiosis died, according to a study by Moodley et al. (1991a) and relatively high mortalities in patients with diarrhoea due to *Cryptosporidium* have also been reported by Smith and Van den Ende (1986) (22.6%) and Wittenberg et al. (1987) (23%). In economic terms, diarrhoeal disease in South Africa is estimated to cost R 3 375 m./a and in KwaZulu-Natal R 785 m./a (Pegram et al., 1998).

The occurrence of cryptosporidiosis and giardiasis is probably higher than recorded as only one in fourteen people with diarrhoea in South Africa seek formal treatment from a health practitioner, clinic or hospital every year, while approximately 43 000 South Africans have been estimated to die every year from diarrhoea (Pegram et al., 1998). Many symptomatic people do not seek medical treatment as they cannot get to a hospital or they visit traditional healers. Medical treatment is also not sought if the infection is mild or due to ignorance of the symptoms.

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