8 Advice to the immunocompromised individual

8.1 Introduction

8.1.1 Cryptosporidium parvum is a highly infectious protozoan parasite responsible for cryptosporidiosis in humans and many animals. C. parvum oocysts discharge sporozoites which then attach to and replicate in the intestinal epithelium, causing changes in electrolyte handling (Griffiths et al. 1994). The initial attachment of the parasite to host cells is a pre-requisite for the pathophysiological events in infection (Joe et al. 1998). Immunocompetent individuals experience a transient diarrhoea, while those with impaired immunity, such as AIDS patients, are unable to clear the infection and severe diarrhoea (McGowan et al. 1993) and cholangitis (Forbes et al. 1993) may result. Cryptosporidiosis in the immunocompromised subject often results in a chronic life-threatening gastroenteritis with a high mortality (Flanigan et al. 1992; Blanshard et al. 1992).

8.1.2 Immunocompetent hosts respond to infection with antibody production and the secreted antibodies appear to reduce parasite numbers in the intestine. Nevertheless, antibodies to C. parvum do not seem to be able to protect AIDS patients from heavy parasite burdens (Goodgame 1996) and it seems likely that cell-mediated immunity is important for recovery from C. parvum infection. In HIV-infected patients there is a clear relationship between disease severity and CD4 counts (Flanigan et al. 1992; Blanshard et al. 1992). However, in many other conditions which result in impaired immunity the outcome and severity of cryptosporidial infection has not yet been identified clearly. For example C. parvum was identified recently as an important pathogen in boys with the hyper-immunoglobulin M (hyper-IgM) syndrome (Hayward et al. 1997). Several other host defence factors are also thought to contribute to C. parvum immunity, including the cytokines IFN-γ and IL12. It is not surprising therefore that infection by C. parvum could readily occur in several primary and secondary immunodeficiency states (Cosyns et al. 1998).

8.1.3 The following advice is aimed at immunocompromised individuals. This includes HIV infected persons and other patients immunocompromised as a result of conditions such as: hypo- or agammaglobulinaemia, hyperimmunoglobulin M syndrome, severe combined immunodeficiency, leukaemia (especially during aplastic crises); or as a result of therapy with immunosuppressive drugs, who may wish to take independent action to reduce the risk of waterborne cryptosporidiosis and may choose to take the precautions recommended below.

8.2 Prevention of exposure

8.2.1 Until an effective therapy for C. parvum is available, informing immunocompromised patients of potential exposure risks to Cryptosporidium may be the most useful course of action. They should be educated and counselled about the variety of ways Cryptosporidium can be transmitted. Modes of transmission include:
- contact with infected adults and nappy-aged children;
- contact with infected animals;
- drinking contaminated water;
- contact with contaminated water during recreational activities; and
- eating uncooked food and food (such as fruits and salad) that has been washed with contaminated water.

8.2.2 *Cryptosporidium* may be spread by the faecal-oral route of transmission. Person-to-person and animal-to-person transmission has long been recognised (Fayer and Ungar 1986). Soil contaminated with human or animal faeces and the water that drains through it to rivers, streams and shallow underground wells are also potential sources of cryptosporidial infection. Immunocompromised persons should avoid contact with human and animal faeces. They should be advised to wash their hands after contact with human faeces (eg after nappy changing), after handling pets and after gardening or other contact with soil. They should avoid sexual practices that may result in oral exposure to faeces (eg oral-anal intercourse).

8.2.3 Cryptosporidiosis occurs more commonly in young animals (Current 1987). Immunocompromised persons should be advised that newborn and very young pets may pose a small risk of cryptosporidial infection but generally they should not be advised to destroy or give away pets.

8.2.4 Immunocompromised persons contemplating the acquisition of a new pet should avoid:
- bringing any animal that has diarrhoea into their households;
- purchasing a dog or cat aged less than six months; and
- adopting stray pets.

8.2.5 Immunocompromised persons should also avoid exposure to farm animals such as calves and lambs and premises where these animals are raised.

8.3 Advice on the prevention of waterborne exposure

8.3.1 *Cryptosporidium* oocysts are found commonly in natural waters. Immunocompromised persons should not drink water directly from lakes and rivers. Waterborne infection may also result from swallowing water during recreational activities. Patients should be aware that many lakes, rivers, salt water beaches and some swimming pools (Anon 1994) and recreational water parks may be contaminated with human or animal waste that contains *Cryptosporidium*. Patients should avoid swimming in water that is likely to be contaminated and should avoid swallowing water during swimming.

8.3.2 Several outbreaks of cryptosporidiosis have been linked to public water supplies. During outbreaks, or in other situations in which ‘advice to boil water for drinking’ is issued, bringing the water to boiling point will eliminate the risk of cryptosporidiosis. Use of submicron personal use
filters (ie home/office types) may reduce the risk (Addiss et al 1996) but cannot be relied upon to eliminate it completely. Persons who opt for a personal use filter should be aware of the complexities involved in selecting appropriate products, the purchase and running costs of the products and the logistic difficulty in using them consistently. Manufacturer’s instructions should always be followed.

8.3.3 The magnitude of the risk of acquiring cryptosporidiosis from drinking water in a non-outbreak situation is uncertain. As a precautionary measure, to reduce the risk of waterborne cryptosporidiosis, HIV infected persons with low CD4 counts should be advised to bring to the boil all drinking water from any source. Such individuals should always be advised to bring to the boil drinking water drawn from private domestic water supplies as these have a much higher risk than public supplies of contamination by Cryptosporidium and may have inadequate treatment (Clapham 1997). They should be aware that places such as campsites and remote holiday accommodation may rely on private water supplies. The limited evidence available suggests that bottled water cannot be regarded as universally safe for immunocompromised persons and should be boiled before drinking.

8.3.4 Immunocompromised persons should be advised that ice made from contaminated tap water might also be a source of Cryptosporidium. Ice made at home should be prepared from boiled water. Such persons should also be aware that fountain beverages served in restaurants, bars, theatres and other places may also pose a risk because these beverages, as well as the ice they contain, are made from tap water.

8.3.5 National distributed brands of frozen fruit juice concentrate are safe if the user reconstitutes them with boiled water. Fruit juices must be kept refrigerated from the time they are processed to the time of consumption; only those juices labelled as pasteurised should be considered free from Cryptosporidium. Outbreaks associated with unpasteurised apple cider have been reported (Mshar et al 1997). Other pasteurised beverages and beers are considered safe to drink. No data are available concerning survival of Cryptosporidium oocysts in wine.

8.3.6 Cryptosporidiosis in immunocompromised people often results in a chronic life-threatening gastroenteritis with a high mortality. Whilst the Group recognises that the occurrence of Cryptosporidium in treated water is very rare it considers that the following recommendation will minimise the risk to immunocompromised people from drinking water.

**Recommendation**

8.3.7 The Group recommends that all water, from whatever source, that might be consumed by immunocompromised persons should be brought to the boil and allowed to cool before use.

**References**


