

## Human infection with the *Cryptosporidium* rabbit genotype

*Cryptosporidium* is a protozoan parasite which causes the gastrointestinal disease cryptosporidiosis. This is characterised mainly by watery diarrhoea and abdominal pain and lasting for a couple of weeks. In immunocompromised individuals, the disease can be more severe and even fatal.

*Cryptosporidium* oocysts are shed in the faeces of infected individuals and infection usually occurs through person-to-person spread, contact with animals or consumption of contaminated drinking or recreational water. After being ingested the oocysts excyst in the small intestine where they release sporozoites that attach to the microvilli of the epithelial cells. Whilst in the intestine, the parasites undergo a complex lifecycle before being excreted as robust oocysts. The parasite can continue to be shed even after symptoms resolve and the infected human or animal can excrete millions of oocysts in their faeces. Although the oocysts are unable to reproduce outside a host they are able to survive in the environment for many months and are resistant to several forms of disinfection including chlorine.

Currently, there are 20 valid *Cryptosporidium* species and numerous “genotypes”, infecting in total over 150 host species. The major pathogens are *Cryptosporidium hominis* and *Cryptosporidium parvum* in humans and *C. parvum* in young animals. Other species are pathogenic to birds and reptiles. As few as single numbers of oocysts may cause infection and the environmentally robust nature of oocysts and resistance to chlorine disinfection ensure that cryptosporidiosis is a priority for water treatment professionals.

Infectious disease surveillance for human cryptosporidiosis based on laboratory detection shows that 3000 to 6000 cases are reported annually in the UK (Health Protection Agency and Health Protection Scotland data). Typing a representative proportion of human isolates has shown that >98% of typable isolates are *C. hominis* or *C. parvum*. The remaining isolates include *Cryptosporidium meleagridis*, *Cryptosporidium felis* and *Cryptosporidium canis* (UK *Cryptosporidium* Reference Unit data). Other genotypes have been isolated from humans and animals, although the pathogenicity of these populations is unclear and there is not enough information on these organisms to assign species status.

Recently, the *Cryptosporidium* sp. rabbit genotype has emerged as a human pathogen (Chalmers *et al.*, 2009). In July 2008, an outbreak occurred in Northamptonshire, following mains drinking water contamination with the rabbit genotype from a wild European rabbit (*Oryctolagus cuniculus*), which was found dead in a water tank.

As part of a wider funded project to investigate the biology and taxonomy of the rabbit genotype (Chalmers *et al.*, 2010), Robinson and Chalmers (UK

Cryptosporidium Reference Unit, Swansea) reviewed available data to establish the current knowledge about *Cryptosporidium* spp. in the European rabbit, its potential as a zoonotic source of human *Cryptosporidium* infection, and the natural host range and biological features of the rabbit genotype (Robinson and Chalmers, 2010).

It is estimated that up to 5% of wild rabbits are infected with *Cryptosporidium*, mostly with the rabbit genotype of which humans are the only other known host. It is difficult to calculate the exact prevalence of infected rabbits due to the lack of appropriate studies. Oocyst concentrations may be low; many of the traditional methods of detection have a low analytical sensitivity and have the potential to generate false negative results. This can be overcome by using IMS (Immunomagnetic Separation) to concentrate the oocysts before detection using either IF (immunofluorescent) microscopy or molecular methods. The rabbit genotype oocysts in the Northamptonshire outbreak were able to be retrieved by IMS and detected by *Cryptosporidium*-specific FITC-labelled monoclonal antibody. Modern IMS techniques are currently one of the most effective ways to detect low levels of *Cryptosporidium*.

Both pet and wild rabbits are a potential source of human cryptosporidiosis and as such, good hygiene practices are recommended during and after handling rabbits. Ideally, water supplies should be protected against access by rabbits and other wildlife, but in practice this has proved very difficult to achieve.

## **References**

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