

# Private Water Supply Microbiological Contaminants



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Pathogenic bacteria, viruses and protozoa or parasites are the primary causes of infectious diseases associated with drinking water. A high proportion of outbreaks of waterborne diseases in private water supplies in the United Kingdom have been associated with *campylobacter*, *cryptosporidium* and *giardia*.

## **Campylobacter**

A high proportion of outbreaks of waterborne diseases in private water supplies in the United Kingdom have been associated with *campylobacter*. *Campylobacter* is found in high number in the faeces of infected pigs and poultry with the infective dose being relatively low. It is the most common cause of bacterial gastroenteritis in the United Kingdom and many other developed countries. Producing mild, water diarrhoea, there were over 56,000 reported cases in England and Wales in 2001.

*Campylobacter* can be spread via drinking water and several outbreaks have been associated with private water supplies. A review of *campylobacter* conducted in the United Kingdom found that 7 per cent of the patients diagnosed with the disease drank from a private water source.

Ultraviolet disinfection is the UK's most widely used method for protecting private water supplies from the health risks associated with drinking water that might contain *campylobacter*.

## ***Cryptosporidium***

A high proportion of outbreaks of waterborne diseases in private water supplies in the United Kingdom have been associated with *cryptosporidium*. *Cryptosporidium* is found in the faeces of cattle, sheep and humans, making these carriers the main sources of contamination of private water supplies. It is believed to cause 500 million infections world wide, each year. In healthy people, "crypto" causes an unpleasant gastrointestinal illness that can last up to 28 days. For some people, for example the immunocompromised, it can be life threatening. The infective dose is not known, however it is considered to be below ten and some experts think it may be as low as one. There is no specific medical treatment for *cryptosporidiosis*.

The annual number of positive *cryptosporidiosis* laboratory results in England and Wales is reported to be 3,700 to 5,700. *Cryptosporidiosis* is England and Wales's fourth most commonly identified cause of gastrointestinal disease following *Campylobacter*, *Salmonella* and *Rotavirus*. In one study into the risk of *cryptosporidium* contamination (Clapham, 1997), 9 out of 15 supplies tested were found to contain the protozoa. The second study (Maddison, 2000) found that the number of cases of *cryptosporidiosis* within 100 metres of a private water supply were higher than would be expected in the general population. The third study (Watkins et al., 2001) showed that the presence of *cryptosporidium* is to be expected in most private water supplies.

Clapham (Clapham, 2004) concludes that the findings of these studies prove that private water supplies without reasonable source protection could be considered to be at risk when animals are in the proximity of the source.

Ultraviolet disinfection is the UK's most widely used method for protecting private water supplies from the health risks associated with drinking water that might contain *cryptosporidium*.

# Microbiological Contaminants

## Coliforms (Total Coliforms)

Pathogenic organisms of a faecal origin pose the greatest health risk to any individual drinking water from a private supply. There are two principal groups of faecal organisms; faecal coliforms which mainly include the bacterium *Escherichia coli*; and the total coliform group, that also includes faecal coliforms and mainly species of the genera *Citrobacter*, *Enterobacter*, *Escherichia coli*, and *Klebsiella*.

Although total coliforms are not always faecal in origin, they are used by local Environmental Health Officers as an indicator of wider contamination than animal waste. The presence of any coliforms shows a need to protect the water from access by animals and wash from the fields and to ensure the pipework is in good condition and that any water treatment installation is regularly serviced.

Total coliforms have long been utilised as a microbial measure of drinking water quality, largely because they are easy to detect and enumerate in water.

Ultraviolet disinfection is the UK's most widely used method for protecting private water supplies from the health risks associated with drinking water that might contain *coliforms*.

## *E. coli* 0157 (see "coliforms" for non 0157 strain)

In addition to *campylobacter*, *cryptosporidium* and *giardia*, another pathogen causing concern on UK private water supplies is *E. coli* 0157. Following the food poisoning outbreak in Lanarkshire, Scotland in 1996, which caused twenty six deaths, the strain of *E. coli* identified as *E. coli* 0157 is now recognised as a pathogen in its own right. In contrast to the harmless *E. coli* strains normally found in the gut of all warm-blooded animals, the O157 strain produces a potent toxin. *E. coli* 0157 causes severe diarrhoea and in some cases renal failure and death. Toxigenic *E. coli*, including O157 and other strains, are thought to be carried by 10 to 15 per cent of healthy ruminants, including cattle, sheep, goats and deer. In addition to drinking contaminated water, humans

may become ill through eating raw or undercooked meats, or by faecal contamination of foodstuffs. The incubation period for *E. coli* 0157 is usually between one and 14 days. Symptoms can include diarrhoea, feeling sick, vomiting, stomach pain and fever. Ten years ago an outbreak of the same strain of *E. coli* resulted in the death of 21 elderly people in Lanarkshire. It was the country's worst outbreak of *E. coli* and centred on a butcher's shop in Wishaw. Following this event, new hygiene regulations for the preparation and sale of raw and cooked meats were introduced and a task force set up to investigate, amongst other things, *E. coli* 0157 in private water supplies.

Ultraviolet disinfection is the UK's most widely used method for protecting private water supplies from the health risks associated with drinking water that might contain *E. coli*.

## *Giardia*

A high proportion of outbreaks of waterborne diseases in private water supplies in the United Kingdom have been associated with *giardia*. *Giardia* is the second most important waterborne protozoan parasite after *cryptosporidium*. Seasonality Outbreaks of *giardia* in the UK often occur in late summer. In 1992 a private water supply in England supplying 260 people was implicated in an outbreak involving 31 cases, five of which were confirmed in the laboratory. Inspection of the supply showed there were clear traces of animals having grazed close to the catchment chamber. Person to person transmission of *giardia* can occur where hygiene is poor, largely because *giardia* is infective immediately or shortly after being passed in the stools.

Ultraviolet disinfection is the UK's most widely used method for protecting private water supplies from the health risks associated with drinking water that might contain *giardia*.