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# Coliphages

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## Background

Enteric viruses may contaminate water supplies, causing waterborne disease outbreaks, including gastroenteritis and infectious hepatitis. Microbiological quality of water is typically assessed using total and fecal coliform bacteria and/or *Escherichia coli* as indicators of fecal contamination. However, the literature suggests that these indicators may be inadequate predictors of viral presence, concentration, transport and resistance to disinfection [1,2,3]. Monitoring the virological quality of source and finished waters is desirable, but in many cases prohibitively expensive and time consuming, particularly when traditional cell culture techniques are employed. Molecular techniques, such as Polymerase Chain Reaction (PCR) and Integrated Cell Culture / Polymerase Chain Reaction (ICC/PCR) offer increased sensitivity and specificity as well as more rapid turnaround time[2].

Another approach is to use bacteriophages (viruses that infect bacteria) as indicators of fecal contamination. Specifically, bacterial viruses that use *Escherichia coli* as their host bacterium (known as "coliphages") have been proposed as indicators of fecal contamination. Male-specific ribonucleic acid (RNA) coliphages have been suggested as possible models for enteric virus presence and transport because of their physical similarities to enteroviruses, presence in wastewater, environmental persistence, and resistance to common forms of disinfection [4,5].

Bacteriophages are classified based on their mode of interaction with surface structures of host bacteria. Candidate indicator viruses include somatic coliphages and male-specific coliphages (named for the piliated bacteria they infect). Somatic coliphages may or may not be associated with fecal material, but male-specific coliphage presence is a clear indicator of fecal contamination. When trying to determine whether a water body has received fecal contamination, we recommend a multidisciplinary approach that includes consideration of both somatic and male-specific coliphages as well as other indicators and/or pathogens.

Coliphages may also be helpful in determining whether fecal contamination is of human origin. Male-specific (or F+) coliphages have been further classified into four (4) groups. Strains recovered from human waste are typically groups II and III, whereas groups I and IV are normally found in non-human animal feces [4]. This is significant because enteric viruses from animal feces are not considered to be a significant cause of human illness and

identification of human fecal contamination may aid risk assessment efforts. [4,5]

**Summary –** Coliphages can be useful indicators of fecal contamination and as inexpensive indicators of the fate and transport of animal viruses. In addition, the results of genotyping F+ coliphages can be used to suggest the possible source of fecal contamination (animal vs. human source). However, it should not be assumed that 100% accurate discrimination is possible, and presumptive conclusions regarding the source of fecal contamination of a water body should be formed only after review of the results from the analysis of multiple samples.

**References**


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