

# Factors Influencing Overland Mobility of *Cryptosporidium* Oocysts

Christine E. Kaucner – MSc. Dissertation

**Centre for Water and Waste Technology  
School of Civil and Environmental Engineering  
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## ABSTRACT

The mechanisms responsible for overland transport of faecal pathogens. Particularly *Cryptosporidium* oocysts, from animal sources to water bodies are not fully understood. Surface properties of microbes, such as electrostatic charge and hydrophobicity, are thought to contribute to their aggregation and attachment to solid surfaces. There is conflicting evidence that methods used to purify *Cryptosporidium* oocysts from faecal material may affect the oocyst surface, leading to biased conclusions from transport studies. By studying oocyst surface properties, aggregation and soil attachment, this thesis addressed whether oocyst purification methods influence overland transport studies, and whether oocysts are likely to be associated with particles during transport.

When using the microbial adhesion to hydrocarbon (MATH) assay with octane, oocyst hydrophobicity was shown to be method and isolate dependent, with oocysts displaying moderate to high hydrophobicity in 0.01 M KNO<sub>3</sub>. There was no observed attachment, however, to the hydrophobic octyl-Sepharose™ bead ligands when using the same suspension solution. Oocyst age did not appear to influence their hydrophobicity. A small but statistically significant proportion of oocysts displayed a net negative surface charge as observed by their attachment to an anion exchange ligand (DEAE). There was no difference in hydrophobicity or surface charge observed between purified oocysts and oocysts that had been extracted without the use of harsh chemicals and solutions with dehydrating properties.

Purified oocysts did not aggregate at pH values between 3.3 and 9.0, nor in solutions lower than 0.59 M in ionic strength at a pH 2.7 which is approaching the reported isoelectric point of oocysts. This finding suggests that oocysts may not form aggregates under general environmental conditions. The association of purified oocysts with soil particles was observed in settling columns. Attachment to soil particles was not conclusive since the settling of the soil particles may have entrained single oocysts. Nonetheless, approximately 27% of oocysts were estimated to be unbound to soil or associated with small soil particles. Hence models for oocyst overland transport should consider a significant fraction as single entities or associated with soil particles less than about 3 µm in size.