Effects of Ultrasound on the Survival and Characteristics of Cryptosporidium Oocysts and Giardia Cysts - DTU Orbit (18/12/2018)

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Background: Sonication of fluids has been widely used for cell lyses and decontamination of water and food due to its three major physical and chemical effects: cavitation, implosion of water bubbles with subsequent increase in substrate temperature and liberation of free radicals such as O-. Additionally ultrasound has been used for cleaning filters used for water sampling and purification. Other studies have shown that backwash sampling of filtrates, and thereby collection of microorganisms, can be facilitated by sonication. Methods: We studied the effects of ultrasound with different sonication power and time durations on two of the most common waterborne protozoa Cryptosporidium and Giardia, and examined its effects on parasite characteristics and survival rate using immunofluorescence dyes; DAPI (4',6-diamidino-2-phenylindol) staining/PI (propidium iodide), and analyzed by flow cytometry. Results: The results showed that exposure of Cryptosporidium oocysts and Giardia cysts to ultrasound could reduce their survival rate even if the exposure time was limited to a few seconds. When sonication time was extended, changes in parasite characteristics became clearly visible. Several other factors determine the effects of ultrasound on the parasite, including the sonication power of ultrasound as well as substrate temperature. Conclusions: Ultrasound is harmful for waterborne protozoa even when momentarily applied. However, a mode of operation may exist in which ultrasound can be used for collection of parasites for further study. The specific operational conditions may be tailored to control survival rates and collection efficiency.

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