

INVESTIGATING THE MORPHOLOGICAL FEATURES AND IN-VITRO CYTOPATHIC EFFECTS OF SOLAR IRRADIATED AND NON-SOLAR IRRADIATED *CAMPYLOBACTER JEJUNI* ON RAW 264.7 CELLS

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Background

Several people living in developing countries, especially in rural areas, lack access to microbiologically safe drinking water. The lack of potable water is directly linked to poverty. At the beginning of this century, the World Health Organization (WHO) reported that approximately one-sixth of the world's population did not have access to clean drinking water, and as a result, waterborne diseases constitute one of the most significant public health problems in these countries. Home water treatment methods such as solar disinfection (SODIS) have been implemented to curb the contraction of water-related infections. Solar disinfection is an economical and viable alternative for treating water at a household level. This disinfection method has been shown to inactivate the culturability of *Campylobacter jejuni* in contaminated water efficiently. Therefore, SODIS has the potential to reduce the spread of gastroenteritis in areas where *C. jejuni* is prevalent in the natural aquatic environment.

Methodology

This study investigated the potential for solar irradiated *C. jejuni* to induce cytopathic effects and morphological alterations in RAW264.7 murine macrophage cell line *in vitro*. *Campylobacter jejuni* was cultured in Mueller Hinton Broth and incubated at 42°C under microaerophilic conditions. The bacteria was suspended in mineral water at an OD₅₄₅ of 0.2 (approximately 10⁶ colony forming units /ml) and were solar irradiated for 4 and 8 hours. Controls were exposed to similar atmospheric conditions except for solar irradiation by enclosing the samples in an opaque ventilated box. Afterward, viability was assessed using the Miles and Misra Drop Method. Murine macrophages were stimulated with either the solar or non-solar irradiated *C. jejuni*. Then, morphological changes were observed 24 hours post-infection, using an inverted microscope. Cell viability was assessed using the Trypan Blue Exclusion Assay.

Results

The solar irradiated *C. jejuni* cells were not viable after 4 and 8 hours of SUVR exposure. The murine macrophages were evaluated for evidence of cytopathic effects following 24 hours of co-incubation with the solar and non-solar irradiated *C. jejuni*. Monolayers infected with non-solar irradiated *C. jejuni* cells exhibited cell elongation, cell rounding, and detachment of the monolayers. A close look revealed an elongated morphology, and a notable cell size increase. In contrast, all the cell monolayers engorged with solar-irradiated bacteria showed that the macrophages exhibited a slight increase in macrophage size, the monolayers were still intact.

The reduction in induced cell death in solar-irradiated *C. jejuni* cells at 24 hours post-infection was further confirmed by the Trypan Blue Cell exclusion test. There was a marked decrease in cell viability and cell count in macrophages infected by the non-solar irradiated *C. jejuni*, indicating ongoing cell death. Conversely, the viability in macrophages infected with solar-irradiated *C. jejuni* remained high (above 80%), and the cell counts remained high (above 10⁶ cells/ml).

Conclusion

The reduction in the potency of the solar irradiated *C. jejuni* could account for the decrease in gastroenteritis incidences in long-term solar disinfection users.