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# Solar Photocatalytic Water Disinfection of Escherichia coli, Enterococcus spp. and Clostridium Perfringens using different low-cost devices

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## Abstract

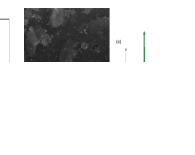
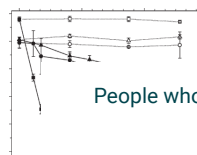
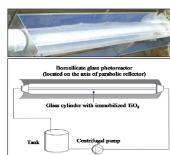
**Background** The purpose of this work was to evaluate the disinfection capacity of two handmade low-cost devices based on solar photocatalytic disinfection (SPC-DIS): a plastic bottle (2 L) with a cylinder inside coated with TiO<sub>2</sub> doped with zinc and a glass reactor (9 L) with an inner cylinder coated with pure TiO<sub>2</sub>. Disinfection experiments of wastewater-derived *E. coli*, *Enterococcus* spp. and *C. perfringens* (10<sup>4</sup> – 10<sup>5</sup> CFU/100 mL) were carried out under natural sunlight during winter. **Results** *C. perfringens* was the most resistant microorganism and *E. coli* the less in all cases. The SPC-DIS bottle achieved 100 % of disinfection for *E. coli*, but only 98.97 % for *Enterococcus* spp. and 96.28 % for *C. perfringens*. The SPC-DIS reactor achieved, at optimal operating conditions, 100 % of disinfection for *E. coli*, 100 % for *Enterococcus* spp. and 99.44 % for *C. perfringens*. Maximum sustainable flow rate (22 L/min) and maximum illumination ratio (1:2) were the best operating conditions. Operating with recirculation (interrupted illumination) favored *C. perfringens* spore formation. Best kinetic models were biphasic for *E. coli* and log-linear for *Enterococcus* spp. and *C. perfringens*. **Conclusion** The two new devices showed higher disinfection capacity than common PET bottles (increase in disinfection rates up to 1.5 and 4.6 times), proving to be promising alternatives to the traditional method SODIS.

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