## Bench-scale Evaluation of Alternative-to-Chlorination Disinfection Technologies for the Treatment of the Maltese Tap-water

Authors : Georgios Psakis, Imren Rahbay, David Spiteri, Jeanice Mallia, Martin Polidano, Vasilis P. Valdramidis Abstract : Absence of surface water and progressive groundwater quality deterioration have exacerbated scarcity rapidly, making the Mediterranean island of Malta one of the most water-stressed countries in Europe. Water scarcity challenges have been addressed by reverse osmosis desalination of seawater, 60% of which is blended with groundwater to form the current potable tap-water supply. Chlorination has been the adopted method of water disinfection prior to distribution. However, with the Malteseconsumer chlorine sensory-threshold being as low as 0.34 ppm, presence of chorine residuals and chlorination byproducts in the distributed tap-water impacts negatively on its organoleptic attributes, deterring the public from consuming it. As part of the PURILMA initiative, and with the aim of minimizing the impact of chlorine residual on the quality of the distributed water, UV-C, and hydrosonication, have been identified as cost- and energy-effective decontamination alternatives, paving the way for more sustainable water management. Bench-scale assessment of the decontamination efficiency of UV-C (254 nm), revealed 4.7-Log10 inactivation for both Escherichia coli and Enterococcus faecalis at 36 mJ/cm2. At >200 m]/cm2fluence rates, there was a systematic 2-Log10 difference in the reductions exhibited by E. coli and E. faecalis to suggest that UV-C disinfection was more effective against E. coli. Hybrid treatment schemes involving hydrosonication(at 9.5 and 12.5 dm3/min flow rates with 1-5 MPa maximum pressure) and UV-C showed at least 1.1-fold greater bactericidal activity relative to the individualized UV-C treatments. The observed inactivation appeared to have stemmed from additive effects of the combined treatments, with hydrosonication-generated reactive oxygen species enhancing the biocidal activity of UV-C. Keywords : disinfection, groundwater, hydrosonication, UV-C

**Conference Title :** ICESWT 2022 : International Conference on Environmental Sciences and Water Treatment **Conference Location :** Lisbon, Portugal

Conference Dates : September 20-21, 2022

1