

Abstract

As the use of alternative drinking water treatment increases, it is important to understand potential public health implications associated with these processes. The objective of this study was to evaluate the formation of disinfection byproducts (DBPs) and cytotoxicity of natural organic matter (NOM) concentrates treated with chlorine, chloramine, and medium pressure ultraviolet (UV) irradiation followed by chlorine or chloramine, with and without nitrate or iodide spiking. The use of concentrated NOM conserved volatile DBPs and allowed for direct analysis of the treated water. Treatment with UV prior to chlorine in ambient (unspiked) samples did not affect cytotoxicity as measured using an in vitro normal human colon cell (NCM460) assay, compared to chlorination alone when toxicity is expressed on the basis of dissolved organic carbon (DOC). Nitrate-spiked UV+chlorine treatment produced greater cytotoxicity than nitrate-spiked chlorine alone or ambient UV+chlorine samples, on both a DOC and total organic halogen basis. Samples treated with UV+chloramine were more cytotoxic than those treated with only chloramine using either dose metric. This study demonstrated the combination of cytotoxicity and DBP measurements for process evaluation in drinking water treatment. The results highlight the importance of dose metric when considering the relative toxicity of complex DBP mixtures formed under different disinfection scenarios.