Innovative analytical tools and technologies to ensure water free of harmful disinfection byproducts (DBP-FREE)

Cristina Postigo [1,2], Jorge Ignacio Pérez-Pérez [1,3], Luz Marina Ruiz-Hernández [1], Ana María Jiménez-Carvelo [4], Miguel Ángel Gómez-Nieto [1,2]

[1] Water Management and Treatment Technologies Research Group. Universidad de Granada, 18071, Granada, Spain
[2] Institute of Water Research, 18071, Granada, Spain
[3] Vicenor Ingeniería, 18004, Granada
[4] Food and Environmental Analysis (ANAMA) Dept. Analytical Chemistry, Universidad de Granada, 18071, Granada

THE CHALLENGE

Chemical disinfection processes to potabilize or regenerate water produce a broad spectrum of disinfection byproducts (DBPs), suspected of producing negative health effects. However, known DBPs cannot explain the toxicity exerted by chlorinated water. The DBP mixtures generated are highly diverse in time and space and have been partially characterized. Thus, *novel advanced analytical tools can assist in the comprehensive characterization of the whole DBP mixture and identification of toxicity drivers, and novel water treatment technologies can foster water safety regarding DBP exposure, by reducing their formation*.

DBP-FREE *is built on the urgent need of providing tools and methodologies for the comprehensive exploration of DBP mixtures* (focusing on the most ***polar fraction***) in drinking water and ***their transformations in DWDN*** and evaluating the ***suitability of far-UVC for water disinfection***.

OBJECTIVES

To optimize quantitative methods based on mass spectrometry (MS) for the determination of regulated and emerging DBPs in drinking water (SO1).

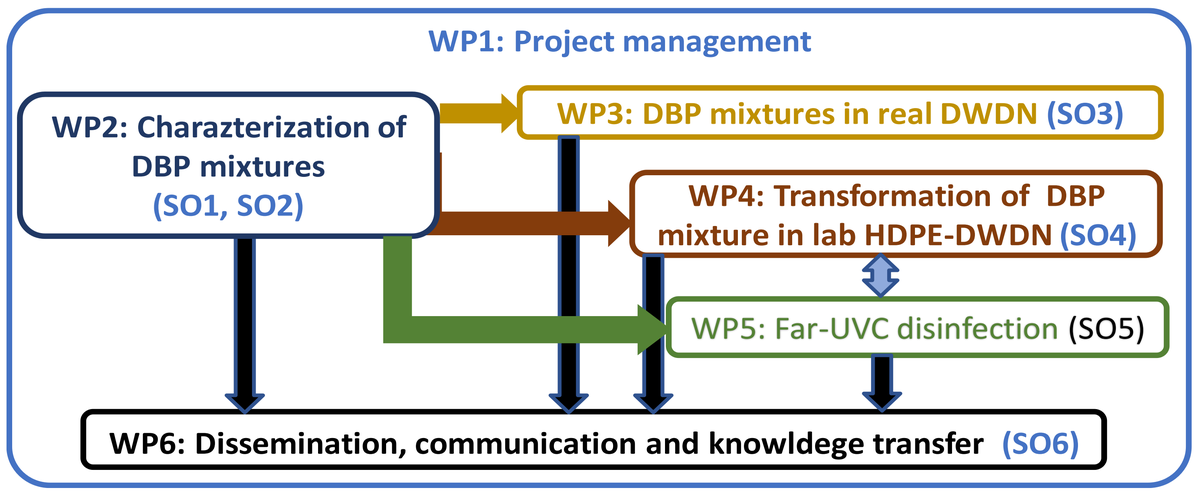
To optimize analytical methods based on high-resolution mass spectrometry (HRMS) to characterize DBP mixtures (SO2)

To explore DBP mixtures in real and lab-scale drinking water distribution networks (DWDN) (SO3 and SO4)

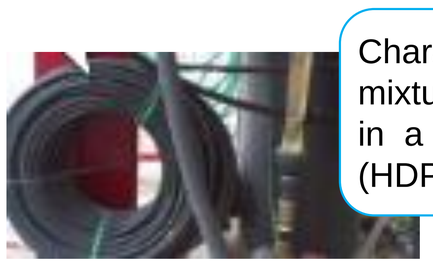
To assess the effect of far-UVC irradiation (222 nm) in drinking water disinfection and its potential effect on DBP precursors (SO5)

To involve and inform stakeholders and end-users (SO6)

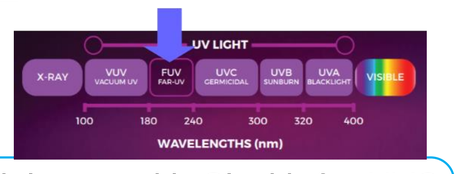
METHODOLOGY



Characterization of DBP mixtures in a DWDN of a DWTP serving 400000 inh. (Granada). Finished water is Cl-disinfected



Characterization of DBP mixtures and biofilm formation in a high-density polyethylene (HDPE) lab-scale DWDN.



DBP formation potential tests with Cl with far-UVC treated water generated in a lab-scale drinking water treatment line

OUTCOMES

Quantitative methods based on LC-MS and GC-MS to determine halogenated DBPs (trihalomethanes, haloacetic acids, haloacetaldehydes, haloacetamides, and haloacetonitriles) in drinking water.

A high-resolution mass spectrometry method to explore unknown polar DBPs in disinfected water

Novel knowledge on the formation of DBPs in drinking water distribution systems

Insights into the use of far-UVC for water disinfection

A sound scientific and technological knowledge and recommendations to manage DBP formation in drinking water

CONTACT US

https://dbptools.ugr.es/

cristina.postigo@ugr.es

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