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Proactive optical monitoring of catchment dissolved organic matter for drinking water source protection

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Ireland has a far greater number of regulatory exceedances for trihalomethanes (THMs) in public water supplies than the next highest European Union member state. In Ireland, 82% of public water supplies originate from surface water catchments which require disinfection to inactivate pathogens and prevent the spread of waterborne diseases. Since the 1970s, it has been known that the use of chlorine for disinfection leads to the formation of potentially harmful disinfection byproducts (DBPs) of which some are suspected carcinogens. THMs are one prominent class of at least 700 potentially harmful disinfection byproducts (DBPs) produced after chlorination of dissolved organic matter (DOM) present in source water which is not removed prior to disinfection.

We introduce a new research project, funded by the Irish Environmental Protection Agency entitled PRODOM: PRoactive Optical monitoring of catchment Dissolved Organic Matter for drinking water source protection. The overall aim of the research is to develop an integrated catchment-level understanding of the spatiotemporal dynamics of DOM precursors and associated DBP formation risk. The project will explore the relationship between optically-active DOM precursors and laboratory formation potentials for key DBPs including emerging classes of potentially more harmful nitrogenous DBPs. Through high-resolution spatial sampling we will develop geospatial DBP formation risk maps and identify risk-driving point and diffuse precursor sources. We will evaluate the potential of state-of-the-art UV fluorescence sensor technology to act as an early warning tool for proactive management of source water at sub-catchment scale. Using high-frequency time series monitoring of fluorescent precursors, we will identify high-risk periods in the catchment hydrograph and evaluate critical precursor sources and pathways to inform a series of catchment management measures designed to reduce DBP formation risk.