Impacts of Hydraulic Residence Time Prediction and Diurnal Loading Pattern on the Estimation of Drug Abuse in Urban Areas - DTU Orbit (13/12/2018)

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The measurement of illicit drugs and their human urinary metabolites in influents of municipal wastewater treatment plants (WWTPs) has been recently used to estimate prohibited drug consumption in catchment communities. In this study, a preliminary estimation of the consumption of cocaine (COC) in Lynetten catchment (Copenhagen, Denmark) was performed. The estimation was done from measured levels of the biomarker benzoylcegonine (BE), its major metabolite and COC by coupling hydrodynamics and biokinetics models. To assess the impact of hydraulic residence time (HRT) prediction on COC consumption estimates, we tested two methods. The conceptual hydrodynamic catchment model was developed to estimate HRT distribution in the catchment. Additionally, a simplified scaling equation was used to estimate mean HRT. A combination of hydrodynamics model and activated sludge model for xenobiotics (ASM-X) simulation results allowed to predict the extent of in-pipe removal of COC and BE in the sewer system. The preliminary assessment results showed that COC consumption rate when mean HRT is considered was 17% lower than HRT from conceptual model. The prediction of COC consumption rates when no diurnal variation of consumption was considered showed that this assumption could impose an error up to 40% as compared to considering 6-hour resolution sampling.

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