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Wastewater based epidemiology: recent advances

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Relevant real-time information about lifestyle habits, public health and wellbeing can be obtained from the chemical analysis of urban wastewater. This approach, called wastewater based epidemiology (WBE), uses the analysis of specific human metabolic excretion products (biomarkers) in wastewater as an indicator of consumption or exposure of the population served by the sewer network under investigation. WBE has successfully been applied as suitable approach for the estimation of illicit drugs consumption, but it has also been exploited to other lifestyle factors such as alcohol, nicotine, caffeine and new psychoactive substances yielding satisfactory results. Its great potential also opens up the possibility of expanding the application of WBE to other human biomarkers in order to provide information about diet, health, disease or environment. For example by linking exposure to substances present in the environment or in food with disease outcomes such as higher prevalence of diabetes or cancer.
Chemical analysis of biomarkers in wastewater is the foundation of the WBE approach. Advanced analytical techniques and expertise is required to obtain accurate quantitative data. The generally low analyte concentrations in combination with the complexity and unknown composition of the wastewater matrix may hamper not only the accurate quantification but also sound identification. Hyphenation of chromatography with mass spectrometry, commonly LC-MS/MS, is the best suited approach to obtain the sensitivity, selectivity and identification requirements in chemical analysis directed towards WBE.
In this work we discuss the recent advances in WBE with emphasis on the analytical aspects and difficulties encountered.