

污水分析方法開發與其在台灣非法藥物使用量監測之應用

Development of wastewater analysis approach and the application in illicit drug consumption monitoring in Taiwan

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Abstract

Drug abuse has always been one of the significant social concerns in Taiwan. Crimes followed by illicit drug industry have resulted in substantial societal costs. The traditional way of illicit drug monitoring, such as population surveys, consumer interviews, and police seizures, requires a long time for surveying. An alternative methodology is needed to acquire detailed spatial and temporal information on illicit drug use. Wastewater-based epidemiology (WBE) has become a feasible approach for estimating drug consumption. The monitored residues of drugs in the domestic sewage can be used to calculate the daily mass loads entering a wastewater treatment plant (WWTP) for these illicit drugs, which provides an insight into temporal trends of drug consumption without self-report bias or ethical issues. Although the WBE has been applied in many countries and has shown to be an innovative and promising tool, no nationwide WBE study has been carried out in Taiwan. The present study aims to establish a wastewater analysis strategy to monitor the use of illicit drugs in Taiwan and utilize the WBE to evaluate the abuse level and consumption of illicit drugs in Taiwan. The study was divided into two parts: quantitation of targeted illicit drugs and suspect/untargeted screening of new psychoactive substances (NPS) in Taiwan's wastewater. For the targeted analysis, the quantitative approach of 15 selected illicit drugs was established, validated, and applied in the analysis of wastewater samples. Eight of them, methamphetamine, amphetamine, ketamine, norketamine, morphine, codeine, mephedrone, and 7-aminonimetazepam, can be quantified in the wastewater samples from WWTP in Southern Taiwan. For the suspect/untargeted screening of NPS, 13 features in LC-HRMS data can be matched with 27 NPS, which are listed on the "List of new psychoactive substances detected in Taiwan" with seized times over 3,000. Two of them can be further confirmed by the MS/MS spectrum matching. The development of WBE can be expected to promote the early warning and monitoring system of illicit drugs, formulate advanced drug abuse prevention strategies, and protect the health of the people.

關鍵字: 污水流行病學、濫用藥物、新興精神活性物質

Keywords: Wastewater-based epidemiology (WBE)、Illicit drugs、New psychoactive substances (NPS)