Common protocol of action for monitoring illicit drugs in wastewater – October 2013

Introduction

Wastewater analysis is a rapidly developing scientific discipline with the potential for monitoring real-time population-level trends in illicit drug use. Originally used in the 1990s to monitor the environmental impact of liquid household waste, the method has since been used to estimate illicit drug use in different populations. It involves sampling a source of wastewater, such as a sewage influent to a wastewater treatment plant. This allows scientists to estimate the quantity of drugs consumed in a community by measuring the levels of illicit drugs and their metabolites excreted in urine.

In 2010, a Europe-wide network (SCORE - Sewage analysis CORe group - Europe) was established to standardize the wastewater analysis approach and to coordinate international studies through the creation of a common protocol of action. Following the success of an initial study in 19 European cities, a demonstration programme was undertaken in 2012 covering 23 cities from 11 European countries in 2012.

This document presents the common protocol of action based on the current understanding of best-practice regarding sample collection, storage and analytical procedure as developed within the SCORE network. It is now being used to conduct investigations at a European scale and it supports the production of homogeneous and comparable data at different sites.

Consensus protocol for the sampling, analysis and reporting

The *common protocol of action for monitoring illicit drugs in wastewater* was agreed at a meeting held at Dublin City University, Dublin, Ireland on the 14th of December 2010. This was revised following experiences of the collaboration in 2011.

A sampling questionnaire should also be completed for each sewer network, preferably by means of an interview with plant staff[1].

Details of sampling

[1] Further information on the sampling questionnaire can be obtained via christoph.ort@eawag.ch.

Parameter	Agreed protocol	Further comment
Sampling point	1st routine influent sampling location at works	To be noted
Sample Type	24 h Composite	
Defined day	Start/Finish between 8 and 10am	
Defined week (obligatory)		
Optional period		
Sampling container	PET or glass (silanised)	Record
Sample volume	> 0.5L	Record
Storage treatment during sampling	<4 °C	Record time and temperature in storage
Storage after sampling	Choose based on the available options in the following preferential order: 1. On SPE cartridge within 12h with internal standards added. 2. Freeze preferentially after addition of internal standards. 3. Freeze	Record period before extraction. Time in freezer if frozen.
Filtration	Internal standard added before filtration Filter type GFC (0.45 µm)	Record any deviation
Additional parameters to be recorded (sampling questionnaire)		
Additional analyses (from STW)	BOD	
	COD	
	N	Report method also if possible
	P	Report method also if possible
Flow data	See sampling questionnaire	
Type of sewage influent	Domestic - industrial	
Temperature	Report if available	
pH	Report if available	

The following compounds are to be analysed in the samples collected. If you cannot analyse for all compounds, please include those that you can. **Each composite sample will be independently analysed in triplicate**.

Compounds to be analysed

Drug	Metabolite	
Cocaine	Benzoylecognine	Additional metabolites where available and report
Amphetamine		
Methamphetamine		
Ecstasy (MDMA)		
THC-COOH		

All participants are welcome to include other compounds (e.g. heroin, 6-MAM, morphine, mephedrone, ketamine, GHB)

For the analysis the following is required:

Quality control

- Internal quality control. The use of isotope labeled internal standards (preferably analyte ILIS) is required for each analyte.
- External quality control. A methanol standard containing the compounds listed above at different concentrations along with two frozen influent samples (1 spiked, 1 unspiked) will be sent to participants. Two vials and two bottles will be sent to each participant.

Data reporting

Participants are requested to report the following data for each sample:

- Method LOQ (Limit of Quantification, as defined by ten times signal/noise of the spiked sample send to the participants as external quality control. If a compound is present in the "blank" sample, then it can be estimated as s/n = 10 from the non-spiked sample).
- Method LOD (Limit of Detection, as defined by a peak with s/n > 3:1).
- Sample Analysis - Mean concentration of 3 measurements based on 3 individual extractions.
- A reporting template will be provided.