



EVROPSKÁ UNIE
Evropské strukturální a investiční fondy
Operační program Praha – pól růstu ČR



Abstract

Project titled “CLEAN WATER - HEALTHY CITY: Contamination of underground, surface and waste waters as a result of human activities” strives to find a global solution of anthropogenic impacts on water quality as an integral part of living environment with the focus on the territory of capital city of Prague. Project will be targeted on mapping of different types of pollution paying particular attention to multiple contaminants in ground, surface, waste and drinking water with potential impact on the health and quality of life of urban citizens, as well as the citizens of the whole region.

The aim of activity IV of this project - **Waste water as a diagnostic medium for the quality of life of Prague citizens** - is to gather information on the consumption of illicit types of drugs, selected medicines and other preparations of human daily consumption through wastewater epidemiology methods which complements standard procedures of mapping the consumption of these substances in the population. This is completely anonymous and fair approach covering all population in affected region or location.

Introduction

Municipal wastewater contains very complex mixture of chemicals including human metabolites - biomarkers. The determination of these specific substances (quantitative measurement) can provide information about the diet, the public health status, the occurrence of diseases, the consumption of alcohol, nicotine, pharmaceuticals, licit and illicit drugs and the exposure of the population to environmental contaminants [1].

The basis of wastewater-based epidemiology (WBE) was laid at the turn of 1999-2000, with the hypothesis that urban waste water can be treated as a diluted sample of urine [2,3], and was first applied in the catchment area of the Po River [4]. Initially, an epidemiological approach to wastewater was used to monitor the consumption of illicit substances in a monitored site and to specify the prevalence and use of illicit drugs in the population.

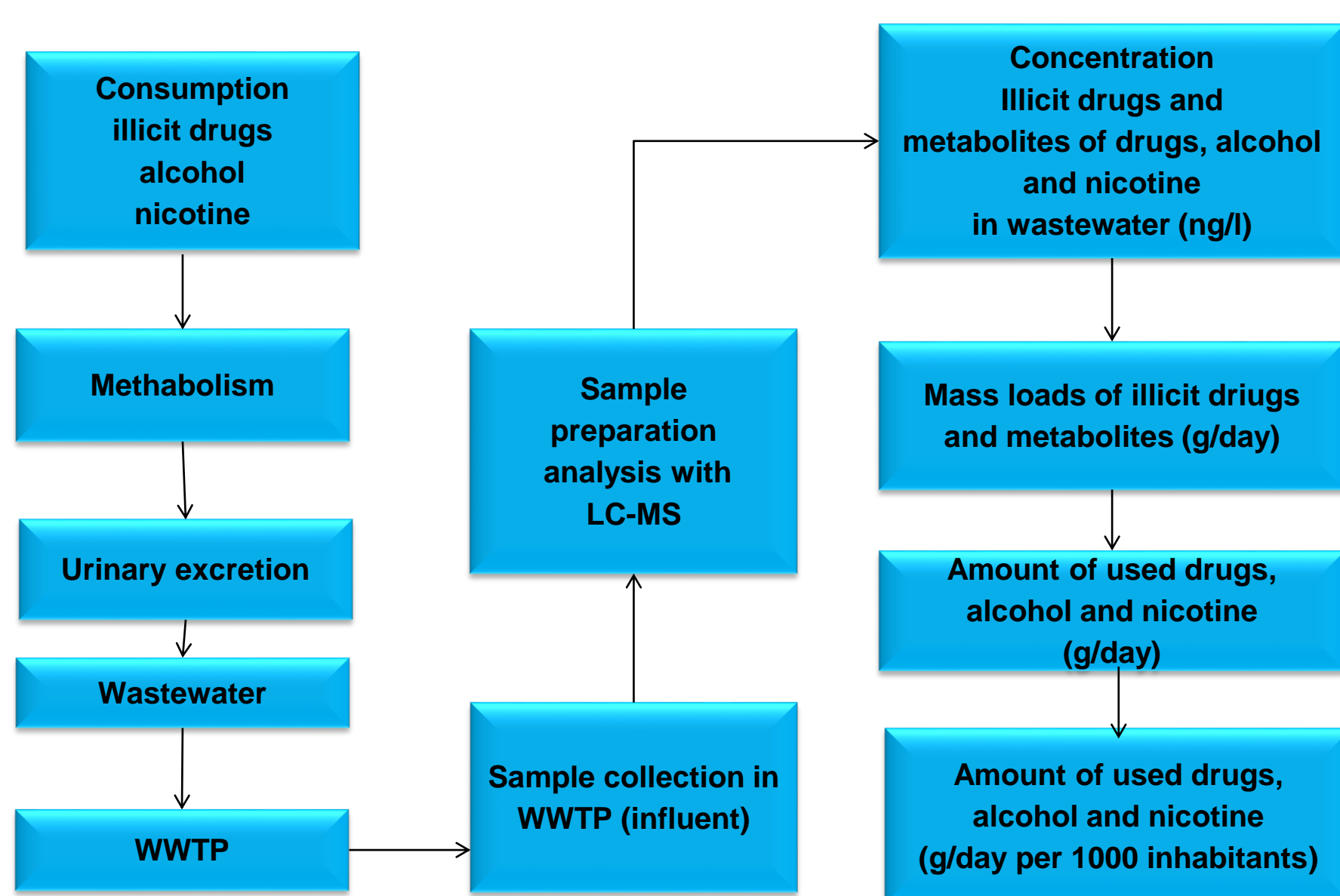


Figure 1. Schematic overview of wastewater-based epidemiology approach [5].

Sampling and measurement

The Reference Laboratory of Environmental Components and Waste, the Department of Hydrochemistry, has been working on this project since the beginning of this year. In addition to illicit drugs and some pharmaceuticals, alcohol metabolites (ethylene sulphate), nicotine (cotinine) and pesticides will also be monitored for two years at selected points of the sewerage network of Prague. The map layer with the information of the consumption of drugs in individual parts of Prague is one of the planned outputs of this project. This map layer will have to be a part of Prague Geoportal.

Composite samples are collected over a period of 24 h two times in week in six sampling profiles. After collection samples are stored in dark at 4 °C and analysed within 3 days, or at -20 °C until processing.

Method of analysis is on-line SPE – LC-MS (in ESI+ or ESI- mode).

Measurement results are being processed. First results for 3,4-methylen-dioxy-methamfetamin (ecstasy) are on Chart 1.



Figure 2. Prague sewerage.

Figure 3. Prague Central WWTP

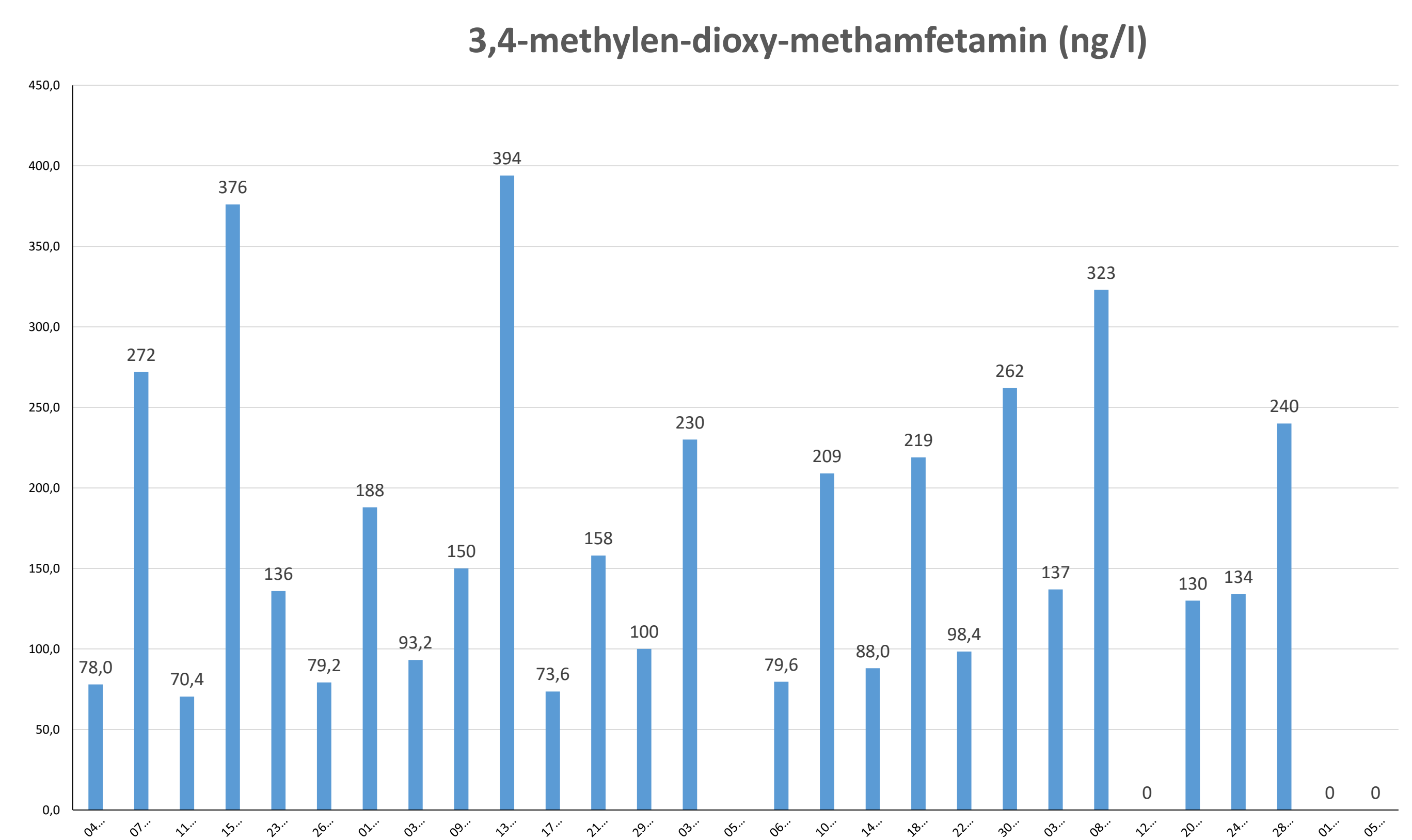


Chart 1. Concentration of Ecstasy in wastewater samples from the influent of Central WWTP of Prague

Monitored compound

Cannabis (Nor –THC)
Amphetamin (AMP)
Methamphetamine (MAMP)
Ecstasy (MDMA)
Cocaine and bensoylecgonine (CO, BE)
Heroine and morphine (HER, MOR)
LSD
Buprenorphine (BUP)
Methadone and EDDP MET, EDDP)
Tramadol (TRAM)
Fentanyl (FEN)
Ethylsulphate (ES)
Cotinine (COT)

Table 1. List of monitored compounds.

Acknowledgements

LEAN WATER - HEALTHY CITY Project is co-funded by the European Union.

Project registration number:

CZ.07.1.02/0.0/0.0/16_040/0000378, Grant

Provider: Capital City of Prague, Program title:

Operational Programme Prague - Growth Pole of the Czech Republic

Call title: Call 24 SC 1.1 - Support for Technology and Knowledge Transfer from Research Organisations to Practice

Project Investigator: T. G. Masaryk Water Research Institute, public research institution

Project works have begun on January 1, 2018 to be completed by June 6, 2020.

<http://heis.vuv.cz/projekty/praha-cistavoda>

Project is funded by the Operational Programme Prague - Growth Pole of the Czech Republic

www.penizeproprahu.cz, info@penizeproprahu.cz

The project would not have been feasible without cooperation with Pražské vodovody a kanalizace, a.s. and VEOLIA Voda Česká republika a.s.

Contact

Věra Očenášková

T. G. Masaryk Water Research Institute, p.r.i.

Email: vera.ocenaskova@vuv.cz

Website: www.vuv.cz

Phone: +420 220 197 451

References

- Kasprzyk-Hordern, B., Bijlsma, L., Castiglioni, S., et al. Wastewater-based epidemiology for public health monitoring. *Water and Sewerage Journal*, 4, p. 25-26
- Daughton, C. D., T. A. Ternes. *Pharmaceutical and personal care products in the environment: Agent of subtle Change? Environ. Health perspect.*, 1999, (107), 907-938.
- Daughton, C. G. *Illicit drugs: contaminants in the environment and utility in forensic epidemiology. Rev. Environ. contam. toxicology*, 2001, (210), 59 -110
- Zuccato, Ettore, Chiara Chiabrando, Sara Castiglioni, Davide Calamari, Renzo Bagnati, Silvia Schiarea a Roberto Fanelli. *Cocaine in surface waters: a new evidence-based tool to monitor. Environmental Health: A Global Access Science Source.*, 2005, 4(1), 14-. DOI: 10.1186/1476-069X-4-14. ISSN 1476069x. Dostupné také z: <http://www.ehjournal.net/content/4/1/14>
- van Nuijs ALN et al.: *Science of the Total Environment* 409, 3564-3577, 2011