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Wastewater reveals drug consumption picture

Wastewater contains traces of drugs and their metabolites. This allows us to draw conclusions on drug use – not of individuals, but of entire cities. A study carried out in 2012 and 2013 in 42 European cities shows that above-average quantities of cocaine are consumed in Basel, Geneva, St. Gallen and Zurich. Berne sits in the mid-range, whilst Antwerp and Amsterdam come out on top.

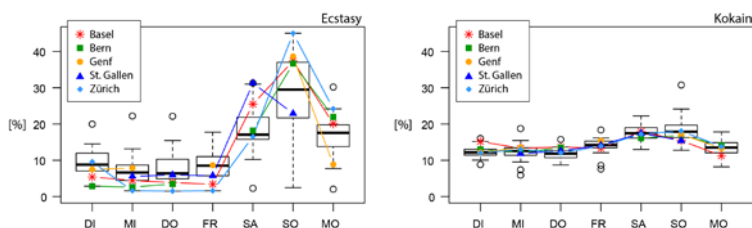
In 2013, wastewater samples from European cities were tested for drug traces for the third time. Basel, Berne, Geneva, St. Gallen and Zurich were among the 42 cities which took part in the study. Over the course of a week, the wastewater of around 1.4 million people in Switzerland was tested for cocaine, amphetamine, crystal meth and ecstasy. The findings are published today in the peer-reviewed journal *Addiction*. Along with the Swiss Federal Institute of Aquatic Science and Technology [Eawag](http://www.eawag.ch), the work involved over 20 other research bodies and laboratories.

High levels of cocaine in Zurich

Zurich had the third highest cocaine use after Antwerp (Belgium) and Amsterdam (The Netherlands) during the week in which the study took place. Taking account of estimates with regard to purity and metabolism, around 1.6 kilogrammes of cocaine are used every day in Zurich. With the exception of Berne, the other Swiss cities are also above the European average, with Basel and Geneva in 9th and 10th place, St. Gallen in 12th place, and Berne at number 15. Whether it is that the cocaine being used in Switzerland has a comparatively high level of purity, or there is a higher use per head or more users than was previously estimated from other studies is yet unknown. In contrast, the figures for the designer drug crystal meth sit well below the average. The forerunners in this case are the Czech cities of Prague and Budweis, and Oslo, capital of Norway. (Detailed tables can be found in the aforementioned article.)

Ecstasy – primarily at weekends

The wastewater analysis enables the reconstruction of a snapshot mapping drug use over time. As one might expect, the use of the recreational drug ecstasy varies dramatically between normal workdays and the weekend (see graph).



One-week profile of ecstasy and cocaine: showing what proportion of the total amount in the week was used on each individual day;

With cocaine, the difference between workdays and weekends is smaller, but nevertheless still statistically significant. This indicates that cocaine is also used during the week – and to some extent on a daily basis by addicts.

Unfortunately, the analysis figures for cannabis in Switzerland did not meet the stringent requirements for the participating laboratories. As Switzerland is known to have a high level of cannabis use, this data would have been particularly interesting. Topping the chart for cannabis are Novi Sad (Serbia), Amsterdam and Paris.

Long term: closer monitoring

From the standpoint of the first author of the study, engineer Christoph Ort from the Swiss Federal Institute of Aquatic Science and Technology Eawag, the “league table” of cities is not the central issue. For him, what is of far greater importance is the objective of obtaining comparative data much more quickly than is currently possible with national drug monitoring programmes. The small numbers of cases, for example, imply that these programmes cannot adequately indicate how many people use a drug in a particular region. When combined with data from other studies and statistics (e.g. surveys at parties, [Addiction Monitoring in Switzerland](#), [Global Drug Survey](#)), the wastewater data, on the other hand, allows trends to be identified and confirmed more rapidly: the rise in ecstasy and cocaine levels found in the wastewater study from 2012 to 2013 is, for example, consistent with the substance analysis data of [Saferparty.ch](#), run by the City of Zurich youth organisation, Streetwork. The rise is attributed to an increase in the purity of the cocaine and to higher-dose ecstasy pills. “Wastewater analyses offer the potential of improved quantification of substance use within a geographically defined area”, affirms Alexander Bücheli from [Safer Nightlife Switzerland](#). “It is still very difficult to draw conclusions as to the actual numbers of users, however, as this requires a series of assumptions to be made.” It is hoped that future transdisciplinary projects will close this gap.

Original article: Spatial differences and temporal changes in illicit drug use in Europe quantified by wastewater analysis. Christoph Ort (Eawag), Alexander L.N. van Nuijs (University of Antwerp) et al. doi:10.1111/add.12570; download as pdf also from: [medias Eawag](#).



Sampling wastewater at the Werdhölzli wastewater treatment plant in Zurich (Images: Eawag, Peter Penicka; Download from www.eawag.ch >> Media)

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Additional information:

- [Press release](#) of the European Monitoring Centre (EMCDDA), Lisbon from 27.5.2014
- How many people does this wastewater come from? More on this in one of ¹ [ES&T's Best Papers 2013](#).
- Recognition for transdisciplinary research: [td-award 2013](#) (shortlisted Project: drugNET-WWA – Illicit drug monitoring network using wastewater analysis; Bern 21.10.2013).

¹ O'Brien J.W., Thai P.K., Eaglesham G., Ort C., Scheidegger A., Carter S., Lai F.Y. and Mueller J.F. [A Model to Estimate the Population Contributing to the Wastewater Using Samples Collected on Census Day](#). *ES&T* **2014**, 48 (1), 517–525.