

# LC-MS<sup>n</sup> analysis of street drugs consumed in drug consumption rooms in the city of Frankfurt: A one year recap

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## Introduction

The first drug consumption room in Frankfurt am Main was established in 1995 in an attempt to deal with the precarious situation in Germany's largest open drug scene near Frankfurt main station with about 200 deaths in public spaces at that time. These rooms intend to help relocate drug consumption from public areas to a controlled, hygienic and safe environment. Since 2000, the 3rd Amendment of the German Narcotics Law serves as a legal foundation for drug consumption rooms, legalizing already existing institutions and enabling the start of new drug help projects. The six federal states where drug consumption rooms are established - Berlin, Hamburg, Hesse, Saarland, Lower Saxony and North Rhine-Westphalia - passed additional regulations for establishing and operating such institutions. While the German Narcotics Law explicitly prohibits the analysis of drugs before use ("Drug Checking"), the responsible authorities agreed on anonymous analysis of drug residues in consumption rooms around Frankfurt main station and a scientific evaluation of the findings in cooperation with the drug department of the City of Frankfurt.

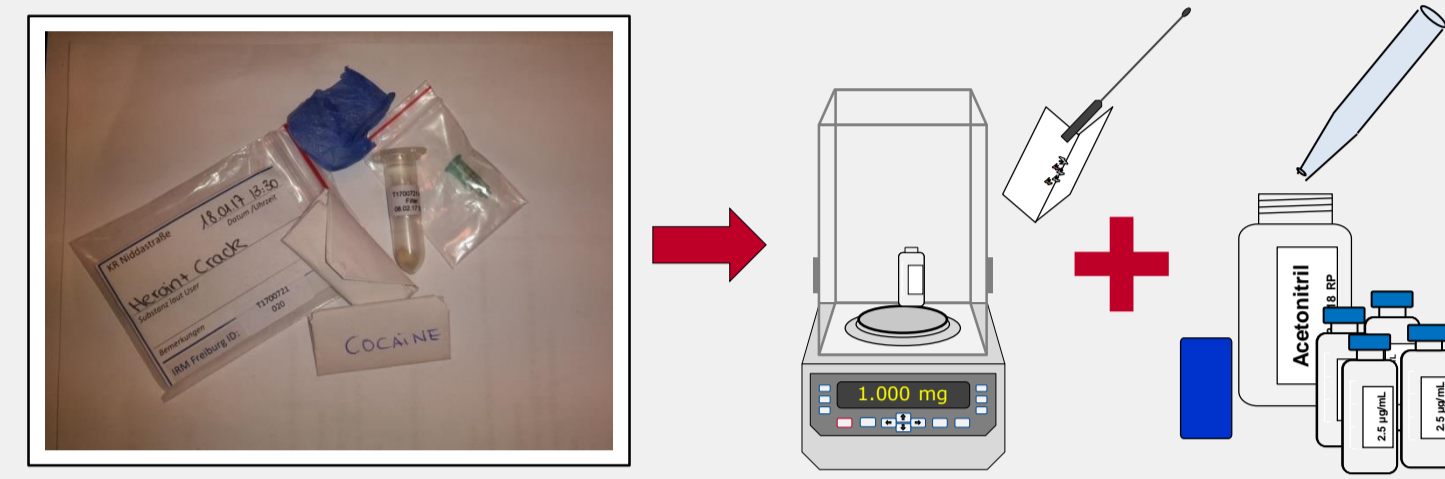
The main objective of this project is to gather information on type and quality of drugs used in drug consumption rooms with a special focus on the prevalence of new psychoactive substances (NPS) in street drugs.

## Methods

Anonymously collected drug packing materials and used syringe filters from three consumption rooms in the area around Frankfurt main station were sent to our laboratory for LC-MS<sup>n</sup> analysis using a modified Toxtyper<sup>®</sup> approach.

If weighable amounts of powder could be found in the packings, 2.5 µg/ml solutions in acetonitrile were prepared for automated semi-quantitative analysis using a one-point-calibration (LOQ: 1 wt%). Packings with only trace amounts of powder or filters from intravenous injection were rinsed with 1 to 2.5 ml of acetonitrile, diluted after reweighing of the dried residue and analyzed qualitatively.

### Sample Preparation



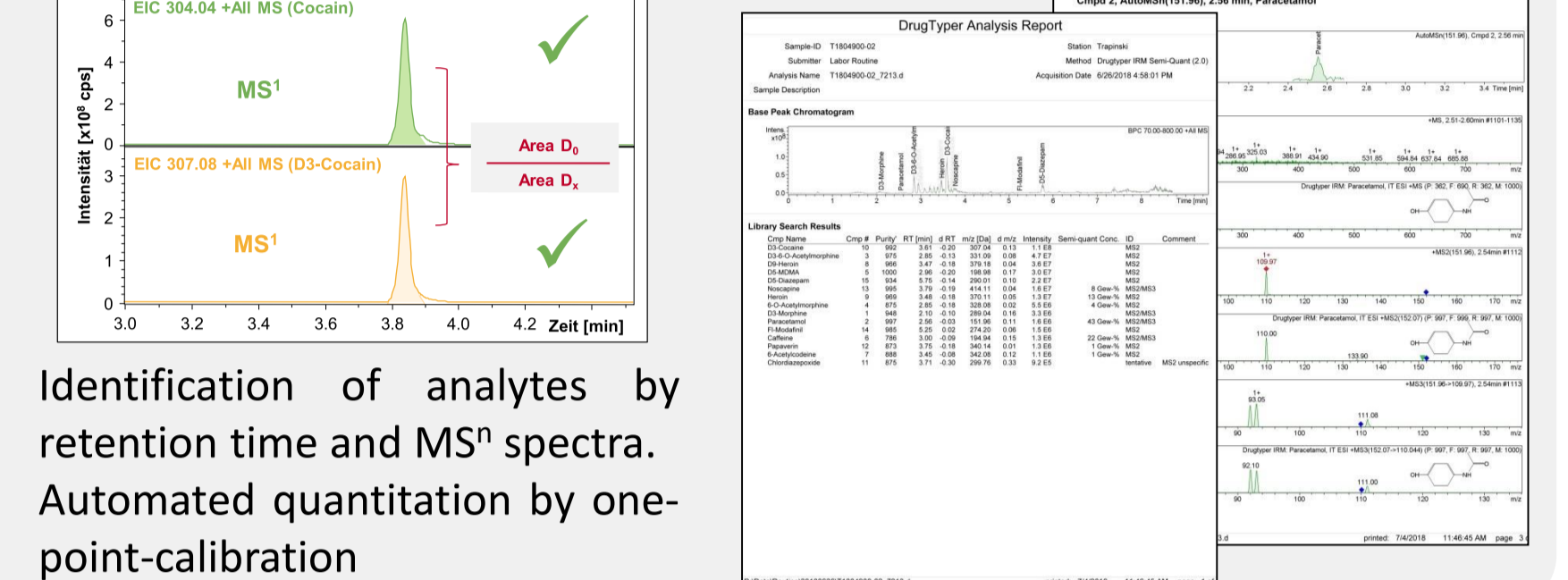
Weighing of powder and dissolving in acetonitrile

### Analysis



Analysis by liquid chromatography ion trap MS

### Data-Evaluation



Identification of analytes by retention time and MS<sup>n</sup> spectra. Automated quantitation by one-point-calibration

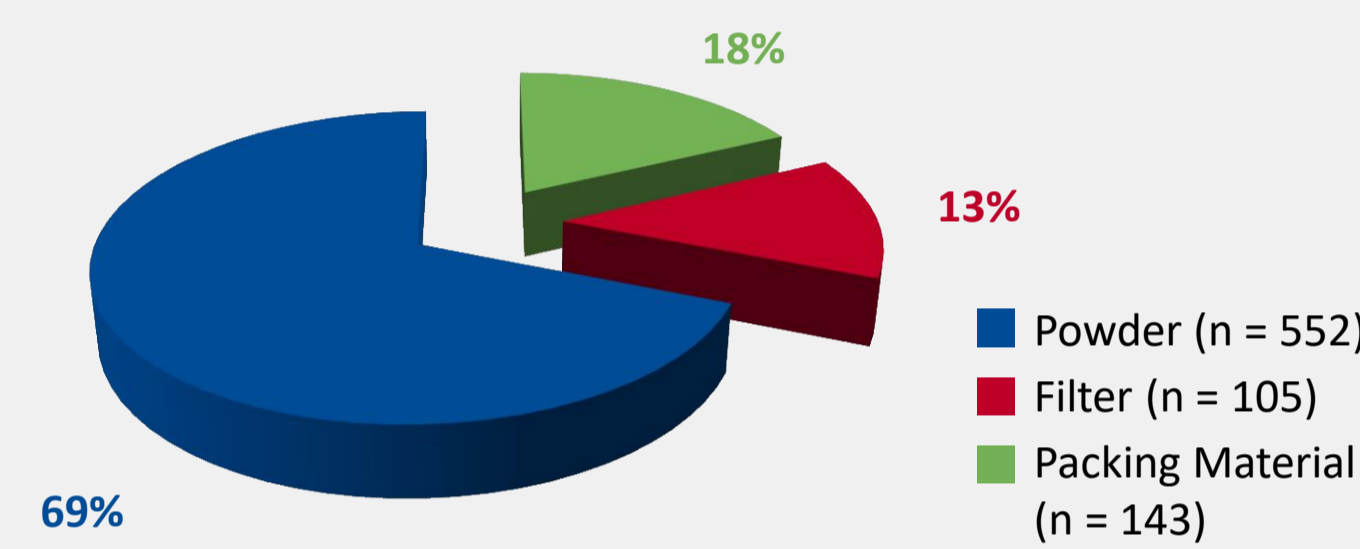
## Analytical Results

A total of 800 samples were sent in within the first year of this study. We qualitatively analyzed 105 filters (F) and 143 packing materials (M) with powder residues. For 552 samples with weighable amounts of sample the screening data was used for a semi-quantitative evaluation.

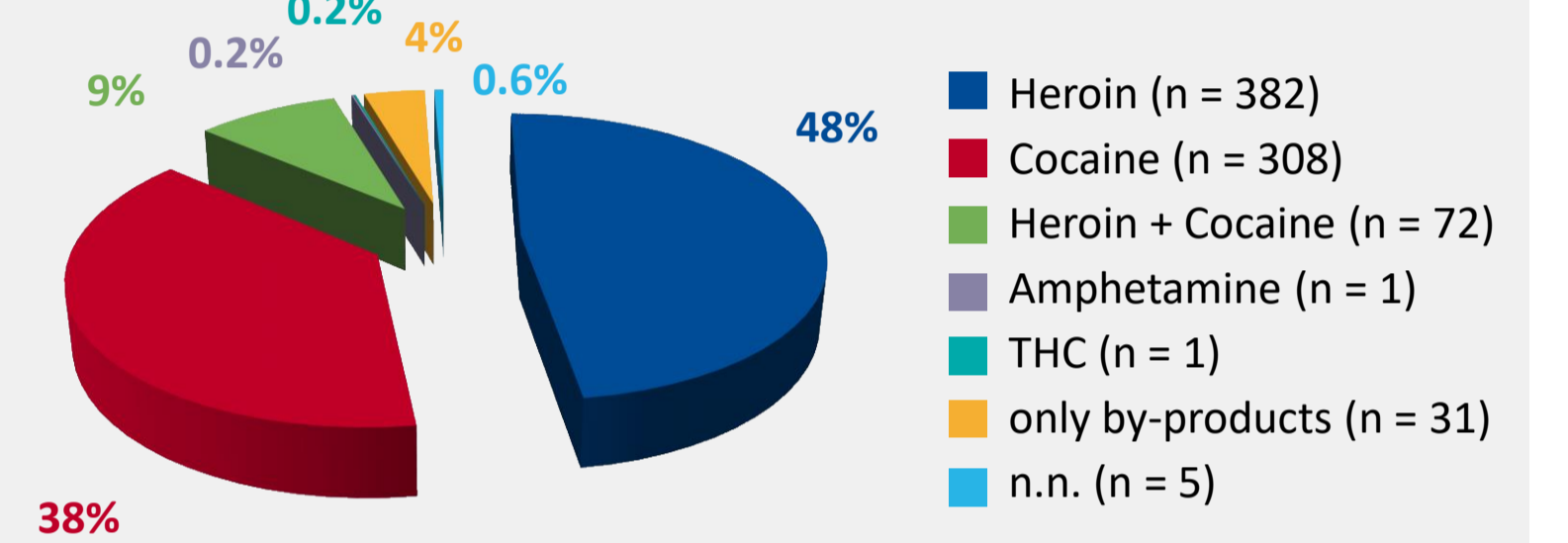
As suspected, heroin and cocaine were the most common illicit drugs consumed by the clients of the consumption rooms in this area of Frankfurt. In 9% of the samples a mixture of these two drugs was found. In 31 samples only by-products (e.g. poppy alkaloids) and/or commonly used extenders but not the actual active ingredient could be detected. There were five samples - three packing materials and two powders - where no compounds could be found by the used LC-MS<sup>n</sup> approach.

The analysis of 800 samples led to 4093 individual positive findings and a total of 30 different compounds could be identified. In detail, these were the four illicit drugs heroin, cocaine, amphetamine and THC, ten by-products or degradation products, six common extenders and ten other compounds, mainly prescription drugs.

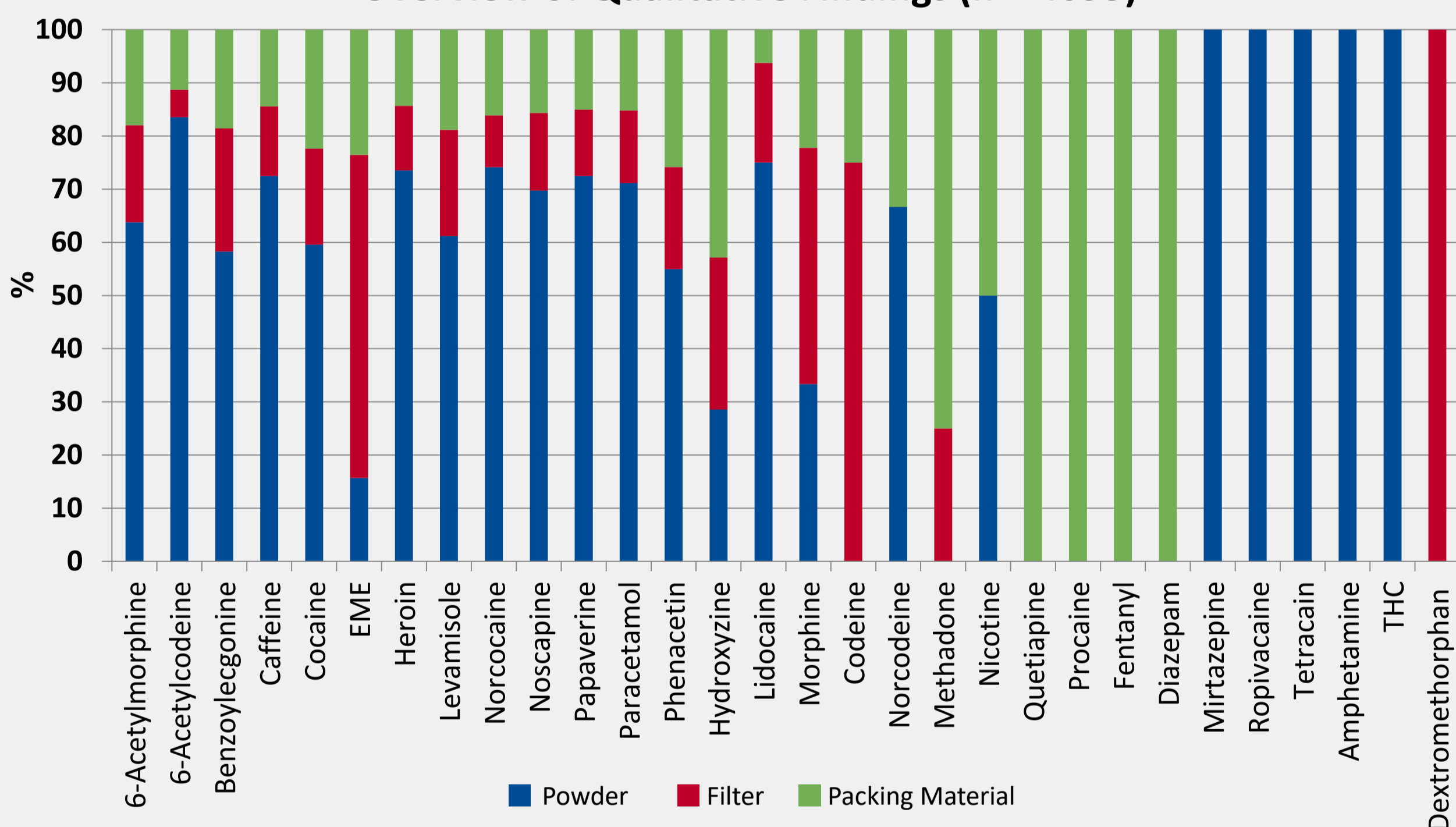
### Analyzed Samples (n = 800)



### Detected Illicit Drugs (n = 800)



### Overview of Qualitative Findings (n = 4093)

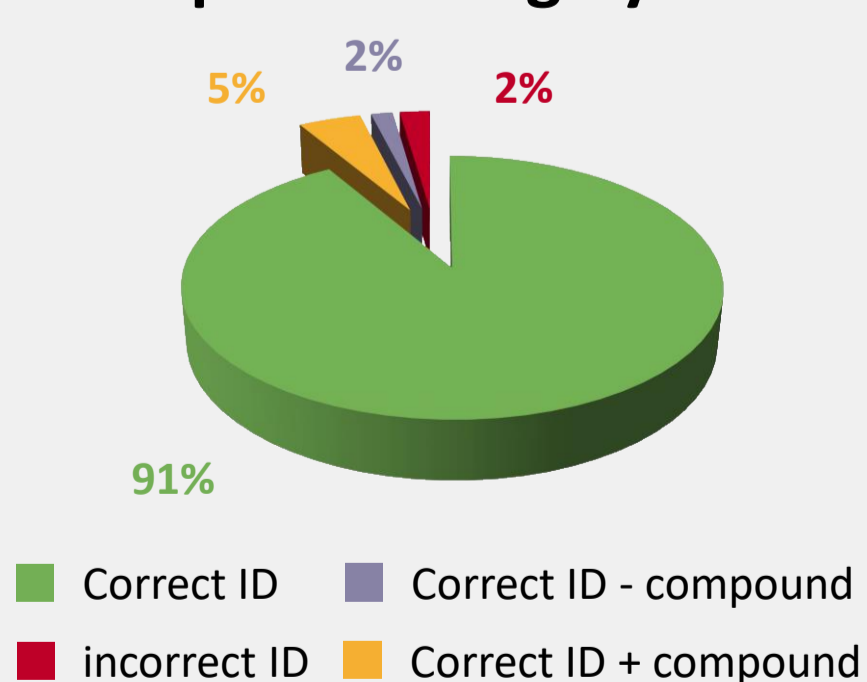


More than 90% of all heroin samples were extended with caffeine and paracetamol. One heroin powder sample additionally contained the local anaesthetic drug ropivacaine. In almost all heroin samples the poppy alkaloids noscapine and papaverine were identified. These alkaloids were also the most detected compounds in samples without any illicit drug.

Approximately 46% of all cocaine samples contained phenacetin, 6% the anthelmintic levamisole and 18% a combination of both. In packing material with cocaine residues, trace amounts of fentanyl (n=5), procaine (n=2) and the antipsychotic quetiapine (n=1) could be detected besides phenacetin and levamisole. Procaine, quetiapine and diazepam could also be found in packing material containing heroin and cocaine. One syringe filter used for heroin injection contained dextromethorphan.

In none of the samples new psychoactive substances like designer opioids or designer stimulants could be detected.

### Sample Labeling by User

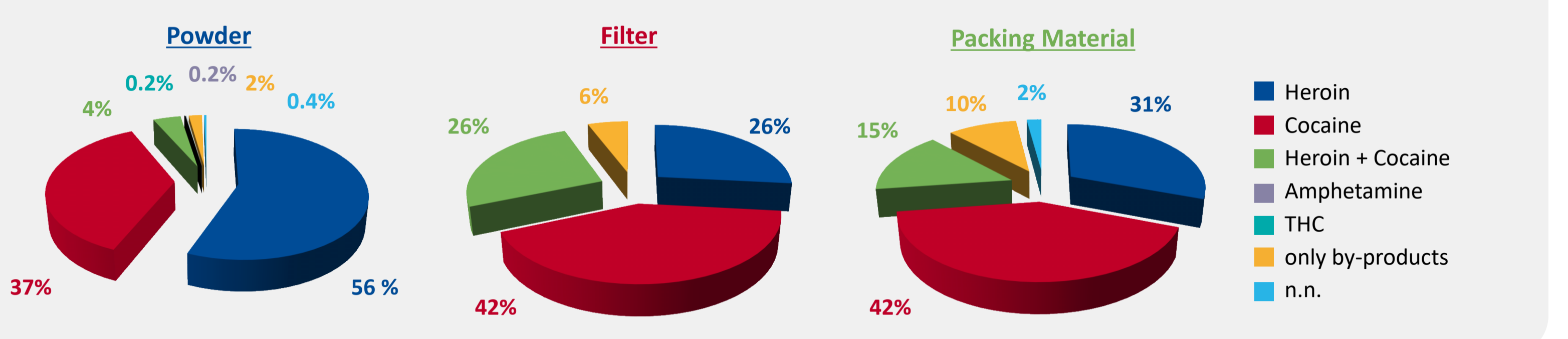


Considering the qualitative results, the users are very well informed about the kind of drugs they are consuming and adulteration of street drugs only seems to play a minor role in this user group.

91% of the analytical results were in accordance with the sample labeling (ID) given by the user while 5% contained the stated compound and additional compounds. Almost all additional findings were made in packing materials or filters.

In only 2% of all cases, the ID did not match the statement of the respective user. Most of these cases were cocaine findings in samples labeled as heroin and vice versa.

### Drug Findings Sorted by Sample Type



### Quantitative Evaluation of Screening Data

Automated semi-quantitative analysis using a one-point-calibration was performed for the most frequent drugs, by-products and extenders<sup>[1]</sup>. The initial idea was to subsequently add new recurring compounds to the list of semi-quantitative analytes. Besides the initial list of compounds on the right, only 5 additional compounds could be detected in powder samples. As each of them was only detected once, the script for semi-quantitative evaluation has not been extended up to now.

Weighable amounts of powder could be obtained from 552 samples and data from 310 heroin samples, 204 cocaine samples, and 11 samples with heroin and cocaine was evaluated quantitatively. Cocaine concentrations ranged from 1 to 100 wt.% (70.8 ± 26.6 wt.%) an Heroin concentrations were much lower than expected and ranged from 1 to 58 wt.% (11.2 ± 8.2 wt.%).

For comparison, the overview on European cocaine and heroin concentrations published in the latest Drug Report of the EMCDDA are shown in blue on the right. According to staff members of the consumption rooms, most cocaine is consumed as "crack" which might explain the relatively high number of cocaine concentrations that were above the international IQR.

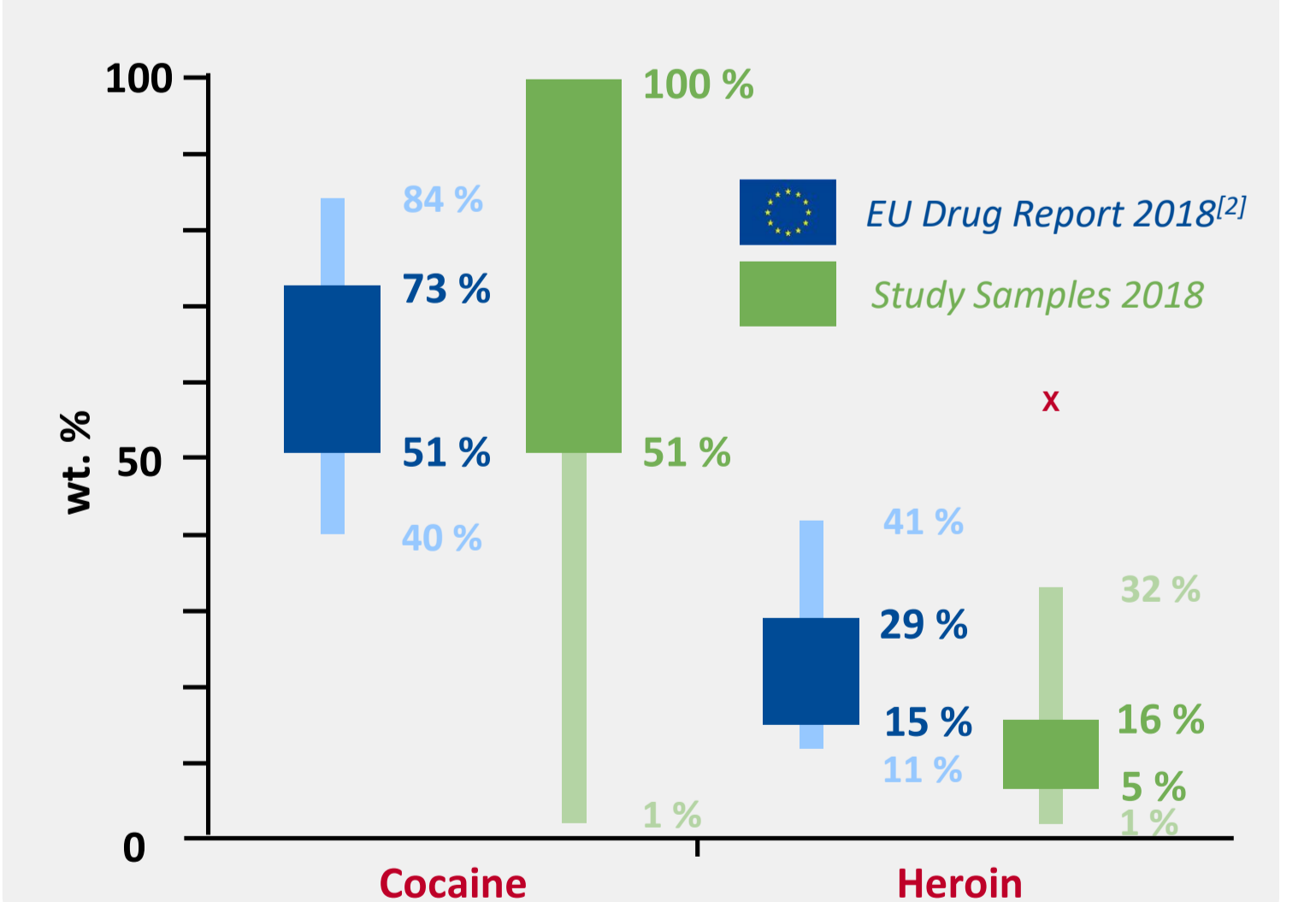
According to the German Drug Report 2018<sup>[3]</sup>, median cocaine concentrations at retail level were 74.9%. Average quantitative cocaine results from this study (median: 73 wt.%) were in good agreement with published data from Germany in 2017.

Median heroin concentrations of 9 wt.% found in this sample set were clearly below the national median of 19.3%.

Due to the type of sample and the limited amount of sample material - sometimes below 1 mg - it was not possible to generate representative homogenized samples according to forensic chemistry guidelines for analysis of seized materials.

Cocaine  
Heroin  
Caffeine  
Levamisole  
Paracetamol  
Phenacetin  
6-Acetylcodeine  
6-Monoacetyl morphine  
Noscapine  
Papaverine

### Quantitative Cocaine and Heroin Results



## Conclusion

As expected, cocaine and heroin are the most common drugs consumed in the three consumption rooms in this area of Frankfurt. Cocaine concentrations were comparable with national and international data, while heroin concentrations were much lower than expected. Up to now, there were no unusual analytical findings apart from three prescription drugs in three powder specimens. The source of other prescription drugs e.g. fentanyl found in packing materials or filters could not be reliably determined.

Regarding the high percentage of correctly labeled sample material, drug users participating in this study seem to be well informed on the type and quality of drugs they consume. According to the data collected, adulteration of drugs with NPS does not seem to be an issue among this particular drug scene in Frankfurt. Common rumors of adulteration of street drugs with harmful compounds like strychnine could not be proven by the analytical results.

The analytical approach is not considered to be used in forensic cases but it's a sufficient and easy-to-use method for qualitative and quantitative analysis of all kinds of powders and materials and a valuable tool to assess the potential harm of such specimens.

## Acknowledgments

We would like to thank the staff members and clients of the three participating drug consumption rooms for their collection of sample material and the City of Frankfurt for financial support of this ongoing study.

## References

- [1] Peter et al. - Poster P209 2017 SOFT-TIAFT Joint Meeting, Boca Rotin, FL, USA
- [2] European Drug Report 2018 - [www.emcdda.europa.eu/edr2018\\_en](http://www.emcdda.europa.eu/edr2018_en)
- [3] Germany - Country Drug Report 2018 [http://www.emcdda.europa.eu/countries/drug-reports/2018/germany\\_en](http://www.emcdda.europa.eu/countries/drug-reports/2018/germany_en)