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Analysis of Drugs of Abuse in Anonymously Collected Urine and Soil samples from a Music Festival in Scandinavia

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Aim: Pooled human urine and soil from urinating spots were collected anonymously at a Scandinavian music festival. Samples should be screened for drugs of abuse, particularly novel psychoactive substances (NPS), but also therapeutic drugs and ethanol.

Methods: Twenty-one urine samples were collected anonymously from urinal and HMMA-d₃ and trimipramin-d₃ were added as internal standards. Additionally, 12 soil samples were collected near fences where people urinated. Urine samples were processed by enzymatic conjugate cleavage, SPE (HCX and C18), and acetylation prior to GC-MS. Soil samples and urine samples were also prepared by adding acetonitrile, shaking, centrifugation, and evaporation. Extracts were then analyzed by UHPLC-MSⁿ (TF LXQ), UHPLC-HRMS/MS (TF Q-Exactive), and GC-MS (TF ISQ). Urine samples were additionally tested for 9-carboxy-THC by immunoassay and ethanol by headspace GC-MS

Results: In the urine samples, the following compounds (and their metabolites) could be detected: cocaine (in 13 samples), levamisole (11), MDMA (9), amphetamine (2), and methamphetamine (2). Furthermore, therapeutic drugs such as metoprolol, carbamazepine, citalopram, quetiapine, methylphenidate, sertraline, and loperamide could be detected. 9-carboxy-THC was detected in most samples by immunoassay and confirmed by GC-MS; six thereof with immunoassay concentrations >50 ng/mL. The average ethanol concentration was 0.60 g/L ± 0.12 ($\alpha=0.05$, n=21). In the soil samples, the following drugs of abuse could be detected besides several therapeutic drugs: cocaine (9), MDMA (7), sildenafil (2), ketamine (1), amphetamine (1), and oxycodone (1).

Conclusions: NPS were detected neither in urine nor in soil samples. This might be due to low concentrations based on their negligible consumption at the studied festival side or chemical instability. Soil samples could be proved to be useful for investigating consumption of drugs of abuse as a supplement to urine samples

Keywords: drugs of abuse, pooled urine samples, soil samples