

Determination of Cannabinoids, Cathinones, and Synthetic Opioids Using Wastewater-based Epidemiology

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Unregulated new psychoactive substances (NPS) in “pure” or “preparation” forms are designed to mimic the effects of controlled substances, and are introduced and reintroduced in the market as a cheap substitute of established regulated drugs in quick succession to loophole the law enforcement efforts on combating drugs. For example, carfentanil, a synthetic opioid activates the opioid receptors similar to morphine but it is astoundingly potent compared to a typical drug of abuse (100 times more potent than fentanyl and 10,000 times more powerful than morphine). Based on the cost- and time-intensive forensic analysis, National Drug Early Warning System reported the a total of 632 identifications of NPS including 502 opioids/analgesics, 74 synthetic cannabinoids, 24 cathinone identifications in the second quarter of 2018 in the USA. The UPLC-MS/MS based analytical technique was developed capable of determining trace level NPS in wastewater. The cost-effective, comprehensive, and near-real-time approach, wastewater-based epidemiology, was used for **the first time** in the U.S. to determine the prevalence of 43 NPS in four U.S. communities. Methcathinone, 5-IT, MAB-CHMINACA, 4-methylamphetamine, 1-(3-chlorophenyl) piperazine (mCPP), 4-methyl pentedrone, 2-methyl-4'(methylthio)-2-morpholinopropiophenone, alpha-ethylaminohexanophenone, carfentanil, methoxyacetyl fentanyl, and valeryl fentanyl were the most abundant NPS.