Parallel artificial liquid membrane extraction of new psychoactive substances in plasma and whole blood

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Parallel artificial liquid membrane extraction (PALME) was combined with ultra-high performance liquid chromatography-mass spectrometry (UHPLC-MS) and the potential for screening of new psychoactive substances (NPS) was investigated. PALME was performed in a 96-well format comprising a donor plate, a supported liquid membrane (SLM), and an acceptor plate. Uncharged analytes were extracted from plasma or whole blood, across an organic SLM, and into an aqueous acceptor solution, facilitated by a pH gradient.

MDAI (5,6-methylenedioxy-2-aminoindane), methylene, PFA (para-fluoroamphetamine), mCPP (meta-chlorophenylpiperazine), pentedrone, methoxetamine, MDPV (methylenedioxyamylevalerone), ethylphenidate, 2C-E (2,5-dimethoxy-4-ethylphenethylamine), bromo-dragonfly, and AH-7921 (3,4-dichloro-N-[1-(dimethylamino)cyclohexyl]methyl)benzamide) were selected as model analytes. Optimization of operational parameters was necessary as the analytes were novel to PALME, and because PALME was performed from whole blood for the very first time. In the PALME method developed for plasma, the analytes were extracted from a 250 µL alkalized donor solution consisting of 125 µL plasma sample, 115 µL 40 mM NaOH, and 10 µL internal standard. In the PALME method from whole blood, the 250 µL alkalized donor solution consisted of 100 µL whole blood, 50 µL deionized water, 75 µL 80 mM NaOH, and 25 µL internal standard. In both methods, extraction was accomplished across an SLM of 5 µL dodecyl acetate with 1 % trioctylamine (w/w), and further into an acidic acceptor solution of 50 µL 20 mM formic acid. The extraction was promoted with agitation at 900 rpm and was carried out for 120 minutes. Method validation was performed and the following parameters were considered: linearity, limits of quantification (LOQ), intra- and inter-day precision, accuracy, extraction recoveries, carry-over, and matrix effects. The results were in accordance with FDA guidelines.