On-chip electro membrane extraction - DTU Orbit (29/12/2018)

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This paper presents the first downscaling of electro membrane extraction (EME) to a chip format. The voltage-controlled extraction for sample preparation on microfluidic devices has several advantages such as selective extraction removing the high ionic strength of biological samples, preconcentration, fast kinetics with exact control of the beginning, and termination of the extraction. The device comprises a 25 μm thick porous polypropylene membrane bonded in-between two polymethyl methacrylate (PMMA) substrates with channel structures toward the membrane. The supported liquid membrane (SLM) was created by locally filling the pores of the membrane with 2-nitrophenyl octyl ether (NPOE). The sample solution, containing five basic model analytes in 10 mM HCl or urine was pumped through the 50 μm deep donor channel on one side of the membrane. With 15 V applied across the membrane, the protonated basic drugs were selectively extracted from the flowing sample solution, into the organic phase SLM, and further into just 7 μl of 10 mM HCl, serving as acceptor solution. Subsequently, the acceptor solution was analyzed by capillary electrophoresis. The electro membrane chip was highly efficient and even with flow rates resulting in the sample being in contact with the SLM for less than 4 s (3 μl/min(-1)), 20-60% of the amount of the respective drugs in the sample was extracted. The large span in recovery was dependent on the physical properties of the drug substances compared to the SLM, and the individual drug substances were extracted with a RSD in the recovery of less than 5%.

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