Advantages of using a microfluidic-chip as sample treatment miniaturization for a subsequent analysis by HPLC

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Abstract

Statement of the Problem: The most critical stage of the analytical process is the preparation of the sample requiring different stages prior to analysis, long extraction times, large volumes of reagents, etc., with the objective of obtaining a good clean-up for the analysis by instrumental techniques (as HPLC). Nowadays, one of the dominant trends in sample preparation is miniaturization and automation. In this paper, we present the advantages presented by the use of microfluidic systems in this field. These devices allow working in different configurations depending on the nature of the analyte to be extracted: either by liquid phase micro-extraction or by electro membranes.

Methodology: Our group has demonstrated the possibility of on-line and off-line analysis by HPLC. Two pumps are used to introduce the sample and the acceptor phase into the microfluidic device. The microfluidic device is fabricated using two patterned plates of poly (methyl methacrylate), which are symmetrical. The channels are separated by a polypropylene membrane. For off-line analysis, the acceptor outlet (extract) is collected and injected directly into a HPLC. For on-line analysis, the acceptor outlet is connected to the HPLC.

Findings: This type of device provides high selectivity, clean-up, reduces sample volume and low consumption of reagents, significantly reduces time of analysis and has demonstrated its ability to online coupling with HPLC. Additionally, the microchip-devices are reusable (allow membrane exchange) and each membrane is stable during more than 10 consecutive micro extractions.

Conclusion & Significance: The miniaturization and automatization of sample treatment procedures (on-chip) offer multiple advantages compared with existing traditional techniques. It also, offers excellent clean-up either with biological or environmental samples and significantly reduces the time of analysis from the sample collection till data obtaining.

Biography

María Ramos Payan has expertise in “Improving sample preparation techniques focused on microfluidic-chip devices as miniaturization”. The novelty of her microfluidic devices offer more advantages than the existing methodologies. The devices work either using biological and environmental samples and can be coupled on-line to HPLC or mass spectrometry. She has also demonstrated the applicability of microchip devices for diagnostic diseases as diabetes. She has worked at different institutions (University of Seville, University of Huelva, University of Lund, University of Copenhagen and University of North Carolina, USA). Currently, she works at Microelectronic National Center of Barcelona and Universitat Autonoma of Barcelona with the aim of implementing optical detection into microfluidic devices for multiple different applications.

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