MEASUREMENT OF PCB-153 AND DDE IN 20μL OF WHOLE BLOOD BY GCXGC-HRTOFMS

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The concept of sampling newborn infants for a few microliters of blood to screen for inherited endocrine, nutritional, or metabolic disorders has been introduced by Guthrie at the University of Buffalo in 1963 [1] . Human dried-blood spots (DBS) are generally simply obtained by pricking the heel or finger by using single-use lancing devices to sample a few microliters (50-150 μl) of capillary blood. The blood is then collected on sampling cards, which consist in a piece of filter paper made of high purity cotton linters [2] available for several DBS.

In recent years, DBS testing, further evolved towards more extensive use due to the availability of more sensitive and specific methodologies. DBS have thus lately also been considered for exposure to toxicant assessment. To the best of our knowledge, only Dua et al. and Burse et al. briefly reported preliminary data on the potential use of DBS for hexachlorocyclohexane (HCH), dichlorodiphenyltrichloroethane (DDT), and dichlorodiphenyldichloroethylene (DDE) measurement using GC coupled to non-selective micro-electron capture detector (μECD) [3] [4] .

The aim of the work is to develop an innovative minimally invasive analytical strategy to measure selected representative persistent organic pollutants (POPs) (or metabolites or reaction products) in 20μL adult blood samples. This study focuses on PCB-153 and DDE, selected as marker of exposure to PCBs and organochlorine pesticides (OCPs), respectively. The analytical work involved the development of a simple liquid-liquid extraction (LLE) step and a methodology based on GCxGC coupled to HRTOFMS.

Elution of the blood from the filter paper, mixture of extraction solvent, and miniaturization of clean-up columns have been optimized. Formic acid as shown to be efficient for the elution of blood by breaking any emulsion due to lipidic structures and a mid-polar solvent for extraction such as the mix hexane/acetone 70:30 has led to results in accordance (<10% relative error) with PCB-153 and DDE levels in known samples.

For GCxGC-HRTOFMS, two column sets (60m HT-8 x 1,5m Rxi-17 and 30m Rxi-XLB x 1m Rxi-17) were investigated. The use of a low temperature (140°C) negative chemical ionization (NCI) based on a rhenium/yttria coated filament [5] has allowed to reach the instrumental limits of detections (iLOD) requested to quantify target analytes in adult DBS.

References :

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