TOPIC: Advanced Approaches in POPs analysis

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BIOGRAPHY

Jean-François (Jef) Focant did his chemistry studies at the University of Liege (ULg) in Belgium. He also studied at the University College of Swansea in Wales. He completed a PhD in Sciences at ULg. He did his post-doctoral work at the Centre for Disease Control and prevention (CDC) in Atlanta GA in the USA.

He is now an Associate Professor in the Chemistry Department of ULg where he teaches general, analytical and organic chemistry in medicine, veterinary medicine, and Science faculties. He is leading the organic and Biological Analytical Chemistry group of the mass spectrometry laboratory. Main research interests are coupling of sample preparation procedures, development of new chromatography strategies in separation science, hyphenation to various types of mass spectrometric detectors through multi-dimensional systems, and implementation of emerging strategies under QA/QC requirements. Professor Focant has been active in the field of Persitent Organic Pollutant (POP) analyses for the last 10 years.

Professor Focant is author and co-author of more than 50 publications in international journals and authors of 6 book chapters and is referee for international analytical and environmental journals. He is an external expert for the Federal Agency for the Safety of the Food Chain (FASFC), for the European Food Safety Authority (EFSA), for the World Health Organization (WHO), and for the European Commission, Health and Consumer Protection Directorate General. He is member of the Centre for Analysis of Trace Residue (CART) of the ULg.

ABSTRACT

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The 'Quest for the Holy Grail' in the 'dioxin' analysis area is dedicated to the development of reliable procedures that can offer congener-specific results on a short time scale, at a low cost, while avoiding down time issues. Such a procedure obviously has to fulfil strict QA/QC requirements such as the ones listed in Eurachem analytical guidelines and EU or other Directives, but also has to comply with ISO17025 and/or GLP procedures. Each part of such a procedure, namely extraction, clean-up, fractionation, chromatographic separation, and physico-chemical (or biological) measurement, has to be fine tuned to its optimum capabilities.

Whatever the measurement method used, either physico-chemical or biological, the sensitivity has to be at the parts-per-quadrillion (ppq, 10^{-15}) level. This represents an extreme case of ultra-trace analysis and a real challenge in terms of analytical chemistry. Large sample sizes have to be processed and extremely large amounts of matrix-related interferences have to be removed before one can even think about measurement.

Extraction and clean-up procedures can be automated and coupled to a certain extend but the global approach remains time and resource consuming. Automated solid-liquid adsorption chromatographic separations are often used to ensure high sample throughput, but also fractionation into sub-analyte groups that fit the peak capacity of the chromatographic instrument used for conger separation.

Next to the reference gas chromatography (GC) electron impact (EI) isotope dilution (ID) high resolution mass spectrometry (HRMS), other GC-MS methodologies are available. They exhibit some limitations but can also offer alternative solutions that found specific areas of application.

The presentation will highlight various aspects of some recent investigations of alternative methods for the measurement of dioxins, PCBs, OCPs, and PBDEs in biological matrices.

Keywords: dioxins, GC, MS, samplepreparation, PCBs