eurofins | mgt

EnviroNote News

Measurement of Per- and Polyfluoroalkyl Substances (PFAS) in Food and Biotic Matrices

Eurofins | mgt's PFAS centre-of-excellence laboratory in Brisbane has extended its NATA accreditation to the measurement of the full PFAS list encompassing 28 compounds in food and biotic matrices using isotope dilution LC-MS/MS following on from its successful completion of the National Measurement Institute's proficiency study published in November 2017.

Australian Government
Department of Industry, Innovation and Science
National Measurement Institute

Proficiency Test Report
AQA 17-08
PFAS in Soil, Water and Fish

November 2017
Version 1.1

Biota can be a difficult set of matrices to analyse because of different matrix effects but by employing isotope dilution LC-MS/MS and QuEChERS extraction for quantitative recoveries together with secondary solid phase extraction clean-up for the accurate determination of sub-parts per billion levels of Σ28 PFAS in food & biotic matrices is achieved. Combined with the requirements of QSM 5.1 to minimise signal enhancement/suppression, our results can be trusted especially when the data is being used for demanding ecological and human health risk assessments.

Biota Sample Preparation

Eurofins has access to a number of world-wide experts that have specific expertise in the quality assurance/quality control (QA/QC) requirements for collecting food & biota samples, handling, sample preservation and shipping to the laboratory and then sample analysis and data reporting. We are able to provide a sophisticated array of sample preparation techniques depending on the biota types including fish filleting, dissection of crustaceans and preparation of fruit and vegetables. For amenable biotic matrices after the initial preparation they are then cryogenically milled providing an homogenous sample as well as not raising the temperature during this milling step minimising any oxidation impacts. Sub-sampling then becomes a simple task from the homogenate ensuring duplicates and /or triplicate samples are representative of the initial sample. Eurofins recommends contacting our technical experts early on in the preparation of the sampling plan to ensure all bases are covered and all food and biotic matrices are collected and transported in accordance with the most up-to-date information including the correct sample containers, preservation requirements and what implements can or cannot be used thus avoiding costly resampling.

PFAS National Environmental Management Plan (NEMP)

The NEMP acknowledges the bioaccumulative nature of PFAS in both aquatic and terrestrial environments and provides guidance on the selection of different species and foodstuffs that may be required for either human health or ecological risk assessment depending on the site specific issues being investigated when the conceptual site model is being devised. The NEMP also highlights that PFAS and in particular PFOS behaves differently to "traditional" persistent organic pollutants in that concentrations of PFOS are highly

Global Leader - Results You Can Trust

EnviroNote No. 1076 - March 2018

Contacts for further Information

Rhonda Chouman	+61 3 8564 5000	Michael Horne	+61 499 810 009
Charl Du Preez	+61 2 9900 8460	Peter Gratwick	+61 448 176 035
Matt Deaves	+61 8 9251 9600		

Technical Support

Dr Bob Symons	+61 2 9900 8400
Dr Jack Thompson	+61 7 3902 4606

Laboratories
Melbourne
Sydney
Brisbane
Perth
Christchurch

Offices
Newcastle
Adelaide
Darwin
Auckland

E: EnviroSales@eurofins.com
W: http://www.eurofins.com.au/environmental-testing

variable between species and are not necessarily higher in predatory fish than in fish lower in the food chain or in crustaceans such as prawns and crabs. Concentrations in individual species are also highly variable.
As a result, the following issues should be considered when sampling aquatic biota:

- identification of key species for human exposure and ecosystem health
- sampling of a range of biota rather than focusing on 'sentinel' predatory species
- sampling of sufficient individuals (for ecosystem health) or combined samples (for human health) to adequately capture representative concentrations in key species
- obtaining samples of edible portions for human health assessment, preferably at animal sizes caught and harvested (e.g. fish – fillet, skin on; prawns – head and shell removed; crab – extracted meat; molluscs – edible flesh)
- recognition that some ethnic communities may target less commonly sought species or less commonly consumed parts, such as the liver or eyes, necessitating a broader suite of sampled organs
- recognition that birdlife, such as wetland waders, may be particularly affected and require appropriate assessment.

Uptake and distribution of PFAS

PFAS have contrary to most other persistent organic pollutants (POPs) a low affinity to lipids but bind to proteins. PFAS is mainly associated to cell-membrane surfaces and are predominantly distributed in plasma and in well-perfused tissues such as the liver, kidney and spleen but also in the testes and brain. The longer the fluoroalkyl chain the more of the compound accumulates in the liver of male rats. A recent study determined 21 PFAS samples of autopsy tissues (brain, liver, lung, bone, and kidney) from subjects who had been living in Tarragona (Catalonia, Spain). Although PFAS accumulation followed particular trends depending on the specific tissue, some similarities were found. In kidney and lung, perfluorobutanoic acid (PFBA) was the most frequent compound, and found at the highest concentrations. In liver and brain, perfluorohexanoic acid (PFHxA) showed the maximum levels, while perfluorooctanoic acid (PFOA) was dominating in bone. Lung tissues accumulated the highest concentration of PFAS. However, perfluorooctane sulfonic acid (PFOS) and perfluorooctanoic acid (PFOA) were more prevalent in liver and bone, respectively. The high levels of the short chain PFAS are of concern and in contradiction to the claims that there is no significant bioaccumulation by these shorter-chain PFAS. Eurofins has spent particular effort to ensure that these potentially important shorter-chain PFAS are determined accurately in all food and biotic matrices.

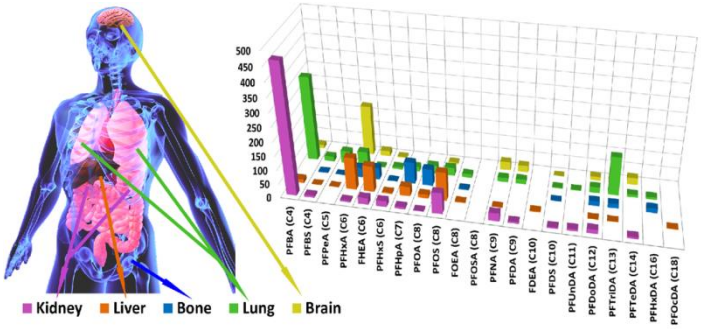

Figure 1: Mean concentrations of PFAS (ng/g) in five human tissues (Perez *et al*., 2013)

Food and Biotic Matrices

Eurofins have selected a range of food and biotic matrices that have been implicated with higher levels of PFAS concentrations but is extending this list to other matrices as part of its continuous improvement philosophy.

Eurofins | mgt Expertise

If you would like to discuss logistical details of your PFAS projects then please contact your local Analytical Service Manager or one of our Business Development team listed below. Technical support can be provided by contacting Dr. Bob Symons or Dr. Jack Thompson.

Global Leader - Results You Can Trust

EnviroNote No. 1076 – March 2018

Contacts for further Information

Rhonda Chouman	+61 3 8564 5000	Michael Horne	+61 499 810 009
Charl Du Preez	+61 2 9900 8460	Peter Gratwick	+61 448 176 035
Matt Deaves	+61 8 9251 9600		

Technical Support

Dr Bob Symons	+61 2 9900 8400
Dr Jack Thompson	+61 7 3902 4606

Laboratories
Melbourne
Sydney
Brisbane
Perth
Christchurch

Offices
Newcastle
Adelaide
Darwin
Auckland

E: EnviroSales@eurofins.com
W: http://www.eurofins.com.au/environmental-testing