PERFLUORALKYL SUBSTANCES IN AUSTRALIAN COOKING MATERIALS

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Introduction

Perfluoralkyl substances (PFAS) have been widely used in the past as water and fat repellants in a range of food related products including non-stick coatings and food packaging materials. Perfluorooctane sulfonic acid (PFOS) and its salts are listed in appendix B of the Stockholm convention, which limits the production and transport and disposal of these compounds. Australia is a signatory to the convention, but is still to ratify the PFAS and other compounds that were added in 2009. Current Australian use is thought to be mainly limited to hazardous facility fire fighting foams and chrome metal plating, with very small quantities used in aviation hydraulic fluids and photo imaging[1].

PFAS are not manufactured in Australia and imports of technical materials are reducing annually, but the presence of PFAS in imported goods is not monitored. A recent Food Standards Australia New Zealand (FSANZ) study investigating potential transfer of PFAS from food packaging materials into foods was not able to detect PFOS or Perfluorooctanic acid (PFOA), and concluded there was only a very low risk from PFAS migrating into Australian food[2].

Recent international research measured a broad range of PFAS in fast food wrapping papers, including PFOA, PFOS, precursor compounds and ionic polyfluoroalkyl phosphate surfactants (PAPS) [3]. The results indicated significant transfer of PFAS from packing materials to food was possible. This raised the possibility that cooking materials used domestically may contain PFAS, so the brief research reported in this abstract measured the levels of PFOA and PFOS in commercially available cooking materials in Sydney.

Materials and methods

Six samples were purchased in supermarkets and variety stores in Sydney in March 2012. They consisted of plastic oven bags, baking paper and tray liners. A portion of each sample (approx 1 g) was accurately weighed and spiked with isotopically labelled surrogates (Wellington, Ontario, Canada) and extracted by tumbling with methanol (LC grade) for 12 hours. The extract was evaporated under a stream of nitrogen, and isotopically labelled recovery standard added.

Analysis was carried out on a Waters Acquity ultra performance liquid chromatograph/ TSQ triple quadrupole mass spectrometer. Mobile phase consisted of a gradient of 2mM ammonium acetate in water:methanol (95:5) and 2mM ammonium acetate in methanol on a XBridge (C18) HPLC column (Waters 2.1 x 50 mm x 3.5 µm). Electron spray negative ionisation was used with argon as collision gas. Multiple reaction monitoring, or MRM, (two characteristic ions) is performed for PFAS analysis. Analyte identification is confirmed when target ions are detected in both the monitored mass transitions, within established retention time windows. Quantification is based on the use of the labelled surrogates in conjunction with relative response factors from calibration standards.

Results and discussion

The levels of PFCs found are given in table 1. Two of the samples had recoveries of isotopically labelled surrogate that exceeded the normally acceptable range of 50-150%. This was thought to be due to suppression of the recovery standard in the LCMS vial for these samples as some particulates were present.

PFOA was detected, in the baking paper (0.43 ng/g), muffin tray liner (7.1 ng/g), and cake tin tray liner (0.13 ng/g). PFOS was not detected in any of the samples at levels greater than the laboratory batch blank.

	PFOA ng/g	PFOS ng/g	PFOA surrogate % recovery	PFOS surrogate % recovery
Laboratory Blank	<0.1	<0.1	121	107
Plastic Oven Bag	<0.1	<0.1	112	112
Plastic Oven Bag	<0.1	<0.1	104	90
Baking Paper	<0.1	<0.1	128	176
Baking Paper	**0.43**	<0.1	131	132
Muffin Tray liner	**7.1**	<0.1	100	110
Cake Tin Tray liner	**0.13**	<0.1	182	178

Table 1 Levels of PFOA and PFOS in domestic cooking materials

The levels of PFOA detected are significantly lower than previously detected in food packaging, for example 300 ng/g in microwave popcorn paper bags[2]. The muffin tray liners were an imported product, which indicates that PFAS are still being used internationally to produce cooking materials for domestic use. A further in-depth study is planned looking at a wider range of goods to measure other PFAS to investigate this potential human exposure pathway.

Acknowledgements
This study was undertaken as part of analytical method development and is not intended to be a rigorous survey of cooking materials. The views expressed herein are not necessarily those of the Commonwealth of Australia.

References:
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