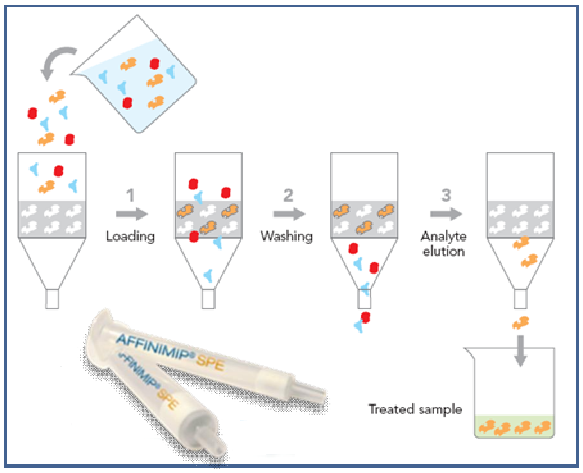
Selective Solid Phase Extraction of Bisphenol A from Vegetable Puree for Infants in Plastic Food Packaging at Low Concentrations using AFFINIMIP® SPE



Background

Bisphenol A (or BPA) is a molecule widely used in the food packaging industry. The migration of this endocrine disruptor compound from the packaging to food is the main source of consumers' exposure to BPA. Its consumption is critical for babies. Therefore, a European directive prohibits the use of BPA to manufacture infant feeding bottles (Directive 2011/8/EU of 28 January 2011). Progressively, countries become more and more restrictive on BPA use for food packaging. In October 2011, French parliament voted a law for banning BPA from canned foods and plastic boxes applicable in 2013 for infants and for all consumers on 1st January 2014. In the same way, **Sweden bans BPA in food packaging for under-threes (2012) as well as Denmark since July 2010 where it is illegal to sell infant feeding bottles and cups, and packaging for baby food, containing BPA.**

So, BPA is a topical issue with a worldwide regulation going to still lower concentrations of BPA allowed in food. So, highly sensitive and reliable detection methods are required for routine analysis of BPA in food samples, particularly for baby food.

In previous application notes, we described protocols enabling the determination of very low concentration of BPA in several matrices (liquid, and powdered infant formula, beer) or packaging (canned foods). This application note describes the analysis of very low concentration of BPA in vegetable puree for infant contained in a plastic food packaging using AFFINIMIP® SPE Bisphenols cartridge.

We demonstrate in this application note that a reliable quantification of Bisphenol A at low concentrations (3 and 24µg/kg) using fluorescence detector is possible. Therefore, the use of AFFINIMIP® SPE Bisphenols enables to eliminate the tedious derivatization step required by gas chromatography.

This method is also perfectly suitable for clean-up before GC-MS/MS or LC-MS/MS.

Results

High analyte recovery and good repeatability

Concentration of BPA Vegetable puree(µg/kg)	Mean concentration (µg/kg)	Recoveries %	RSD_r %
3	2.5 (n=4)	83.0	5.8
24	21.5 (n=4)	89.7	1.9

Table 1. Recovery of Bisphenol A spiked at different concentrations after AFFINIMIP® SPE Bisphenols clean-up of 20mL of loading solution (equivalent to 5g of vegetable puree) and relative standard deviation calculated from results generated under **repeatability conditions**.

Perfect cleanup at very low concentrations

The preparation of a fluid loading solution enables the analysis of a large amount of vegetable puree (equivalent to 5g). It produces a good clean-up and a high enrichment level, thus enabling the determination of very low amount of Bisphenol A with a simple protocol.

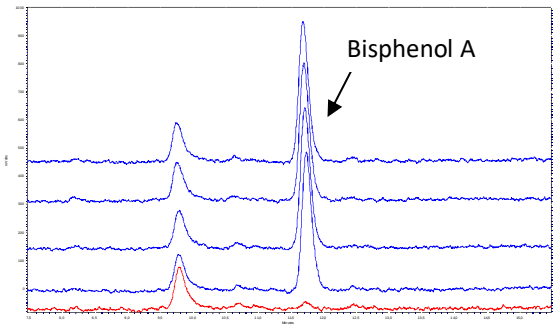


Figure 1. Chromatograms obtained after clean-up with AFFINIMIP® SPE Bisphenols of equivalent at 5g of vegetable puree spiked with Bisphenol A at 24µg/kg (tested four times, blue) or not spiked (red).

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Experimental conditions

Materials

All reagents and chemicals were ACS grade quality or better. Bisphenol A was obtained from Alfa Aesar. Vegetable puree for infant was purchased at a supermarket.

Preparation of the loading solution

100g of Vegetable puree was mixed 2x1min in a blender with 200mL of 50/50 Water/ACN. The mixture was centrifuged at 4000 rpm during 10 minutes and the supernatant was collected and filtered on filter paper (4-7µm). This extract was diluted 1:1 with water. The solutions were then spiked with Bisphenol A at 3 and 24µg/kg and used as the loading solution.

Solid phase extraction (SPE) protocol

The SPE procedure used a 3mL AFFINIMIP® SPE Bisphenols cartridge. The details of each step are as follow:

- Condition the SPE cartridge with 5mL of Methanol-2% Acetic Acid, 5mL Acetonitrile (ACN), then with 5mL of deionized Water
- Load up to 20mL of the loading solution
- Wash the cartridge with 10mL of deionized Water
- Wash the cartridge with 6mL of deionized Water /Acetonitrile (60/40, v/v)
- Dry 1 minute
- Elute Bisphenol A with 3mL of Methanol

The elution fraction was then evaporated and dissolved in the mobile phase.

Analysis

HPLC was performed on a ThermoFinnigan Spectra System with a Thermo Hypersil Gold C18 column (150mm x 4.6mm). Separation was carried out using a gradient at a flow rate of 1mL/min. The detection system was a Jasco FP-2020 with Fluorescence detector set to excitation/emission wavelengths of 230 and 315nm, respectively. The injection volume was 50µL.

	Time (min)	% Water	% ACN
Mobile Phase	0	65	35
	2	65	35
	12	50	50
	20	50	50
	20.5	65	35
	40	65	35

Product references

- **AFFINIMIP® SPE Bisphenols**
  - FS106-02 for 25 polypropylene cartridges 3mL
  - FS106-02G for 25 glass cartridges 6mL
  - FS106-03 for 50 polypropylene cartridges 3mL
  - FS106-03G for 50 glass cartridges 6mL

Related matrices: canned foods, infant milk, beer, water...

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