Nanostructured Liquids Based on Octanoic Acid Vesicles to Extract PAHs in Food

Francisco J. López-Jiménez, Ana Ballesteros-Gómez, Soledad Rubio
Departamento de Química Analítica
Universidad de Córdoba
Campus Universitario de Rabanales. Ed. Marie Curie (Anexo). 14071, Córdoba
a82lojif@uco.es; http://www.uco.es/investiga/grupos/FQM-186

Polycyclic aromatic hydrocarbons (PAHs) are a well-known group of pollutants widely studied and internationally regulated because of their carcinogenic activity. An important way for human intake of these compounds is food. PAHs pollute food directly from air or water (vegetables, meat, fish) or during its preparation (smoked meat of fish) or cooking (roasting, charcoaling or grilling).

Recently, the European Union has published a study where sixteen PAHs are considered as carcinogenic pollutants in food and expresses the need for their regulation[30]. Up to now, European laws have only set limit levels for benz[a]pyrene (BaP) in a variety of foods including meat, fish, molluscs and infant foods. Current legislation considers BaP as an indicator of PAHs contamination, however, the study above cited considers that total occurrence of PAHs cannot be accurately predicted from BaP measurements. In this context, the development of methods that permit to obtain fast and accurate information about the presence of carcinogenic PAHs in food, at the low levels they commonly occur, is mandatory.

In this research, a new analytical method intended to meet the criteria for future regulatory decisions has been developed. It is based on the fast, low cost and efficient nanostructured solvent-based microextraction of the target carcinogenic PAHs from food and their direct quantitation in the extract by liquid chromatography and fluorescence detection. The nanostructured solvent used for extraction was made up of vesicles of octanoic acid and tetrabutylammonium octanoate and it spontaneously formed in aqueous solutions containing octanoic acid and tetrabutylammonium hydroxide at molar ratios around 2. The procedure involved the vortex-shaking of 200 μL of supramolecular solvent and 200 mg of sample in 1.5 mL-eppendorf tubes containing four glass pearls (3 mm of internal diameter) for 10 min at 2670 rpm. Then, the mixture was centrifuged at 15000 rpm for 20 minutes and an aliquot of the extract was injected in the chromatographic system. Recoveries of PAHs in samples ranged between 89 and 108 for a spiking level of 5-fold the quantitation limit of the method. Detection limits for PAHs were 0.2 μg/Kg for benz[*a*]anthracene, benzo[*b*]fluoranthene, benzo[*k*]fluoranthene, benzo[*a*]pyrene, chrysene, dibenz[*a,h*]anthracene, dibenzo[*a,e*]pyrene, dibenzo[*a,h*]pyrene, dibenzo[*a,i*]pyrene, dibenzo[*a,l*]pyrene, 5-methylchrysene, benzo[*ghi*]perylene, 0.9 μg/Kg for benzo[*j*]fluoranthene, 1 μg/Kg for indeno[1,2,3-*cd*]pyrene and 2.5 μg/Kg for benzo[*c*]fluorene. The method was applied to the determination of PAHs in smoked meats, fishes and molluscs proving its suitability for a wide range of foods. No interferences were detected for any of the matrices investigated.

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[30] European Food Safety Authority (EFSA). Findings of the EFSA Data Collection on Polycyclic Aromatic Hydrocarbons in Food. Parma, 2008.