IDENTIFICATION OF CHEMICAL COMPOUNDS PRESENT IN MILK PACKAGING

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INTRODUCTION

Multilayer materials are widely used in food packaging industry. These materials combine various types of plastic film materials or non-plastic films materials (aluminium foil, paperboard, among others) with polymeric adhesives. It is very important to know the composition of the food packaging materials and to identify the compounds that could migrate from the material into the food, with the objective of ensuring that they do not represent a risk for the health of the consumers. Since milk and dairy products are the main components of our diet, in the present study, five samples of milk multilayer packaging (three of whole milk and two of semi-skimmed milk), purchased in a local supermarket, were selected to analyse.

For that purpose, a screening approach was applied to simply and rapidly determine the identity of potential migrants in the packaging by means of solvent extraction technique with subsequent analysis by gas chromatography with mass spectrometry (GC-MS).

MATERIALS AND METHODS

IMAGE	TYPE OF SAMPLE	CODE	THICKNESS	FAT CONTENT	TYPE OF MATERIAL (internal and external side)
	Whole milk	LE01	433 µm	3.6g/100mL	Polyethylene
	Whole milk	LE02	431µm	3.6g/100mL	Polyethylene
	Whole milk	LE03	296 µm	3.6g/100mL	Polyethylene
	Semi-skimmed milk	LS01	430 µm	1.6g/100mL	Polyethylene
	Semi-skimmed milk	LS02	454 µm	1.9g/100mL	Polyethylene

Table 1: Characteristics of the samples used in the study.

EXTRACTION PROCEDURE

Extract of the packaging (of known surface area)

Immersion in 25 mL of acetonitrile

Stored at 70ºC for 24 h

Evaporate 10 mL using a stream of nitrogen to 1 mL

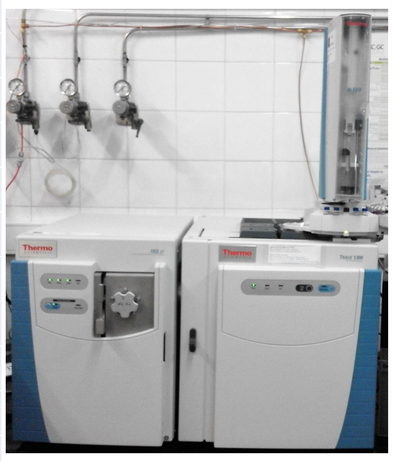
Filter an aliquot with a 0.45 µm PTFE membrane filter

GC-MS METHOD

A method based on GC-MS was applied using a Trace 1300 Series Gas Chromatograph with a Trace ISQ LT mass detector and an AI 1310 autosampler.

Injection Tª	300ºC
Injection volume	1µL
Injection	Splitless
Carrier gas	Helium 1mL/min
Column	ZB-5MS (30 m x 0.25 mm x 0.25 µm)
Tª gradient	40-300ºC
Ionization source	Electron impact
Transfer line Tª	300ºC
Detector Tª	300ºC
Data acquisition	Full scan (range m/z 35-500)
Spectrum library	NIST/EPA/NIH 11 v. 2.0 & Wiley 8th

Table 2: Experimental conditions of GC-MS method.



RESULTS AND DISCUSSION

TR	Compound	CAS no.	SML	TC	Samples
8.19	Ethyl diglycol	111-90-0	-	I	LE01, LE02, LE03, LS01, LS02
8.58	Dipropylene glycol	110-98-5	60 mg/kg	III	LE01, LE02, LE03, LS01, LS02
9.40	Acetophenone	98-86-2	-	I	LE02, LS02
12.60	Caprolactam*	105-60-2	15 mg/kg	III	LE01, LE02, LS01, LS02
14.09	Eugenol	97-53-0	ND	I	LE01, LE02, LE03, LS01, LS02
16.22	Butylated hidroxytoluene*	128-37-0	3 mg/kg	II	LE01, LE02, LE03, LS01, LS02
16.25	2,4-di-tert-butylphenol	96-76-4	-	I	LE01, LE03, LS01, LS02
17.37	Diethyl phthalate*	84-66-2	-	I	LE01, LE02, LE03, LS01, LS02
18.02	Benzophenone*	119-61-9	0.6 mg/kg	III	LE01, LE02, LE03, LS01, LS02
20.25	Isopropyl myristate	110-27-0	-	I	LE01, LE02, LS01, LS02
20.70	Diisobutyl phthalate*	84-69-5	-	I	LE01, LE02, LE03, LS01, LS02
21.21	7,9-Di-tert-butyl-1-oxaspiro [4.5]deca-6,9-diene-2,8-dione	82304-66-3	-	III	LE01, LE02, LE03, LS01, LS02
21.75	Dibutyl phthalate*	84-74-2	0.3 mg/kg	I	LE01, LE02, LE03, LS01, LS02
26.16	Diethylhexyl adipate*	103-23-1	18 mg/kg	I	LE01, LE03, LS01, LS02
27.35	Bis(2-ethylhexyl)phthalate*	117-81-7	1.5 mg/kg	I	LE03, LS01
28.38	Octocrylene*	6197-30-4	0.05 mg/kg	III	LE02, LS01, LS02
29.11	Bis(2-ethylhexyl) terephthalate*	6422-86-2	60 mg/kg	I	LE02, LS01, LS02
29.67	Squalene	111-02-4	-	I	LE01, LE02, LS01, LS02

Table 3: Some of the chemicals identified in the ACN extracts of the food packaging analyzed.

Full scan chromatograms revealed, after the comparison of the sample mass spectra with available mass spectral libraries, the presence of several compounds. Further confirmatory analysis was performed using commercially available standards (indicated with asterisk in the table).

The next step will be to evaluate the migration of the analytes identified in the food matrices in order to carry out an assessment of the exposure with the avaliable consumption data of the population.

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