

Indoor-generated particulate matter: chemical signatures and associated mutagenic and cytotoxic effects

Daniela Figueiredo, Centre for Environmental and Marine Studies, Department of Biology and Department of Environment and Planning, University of Aveiro
Supervisory Team

Helena Oliveira, Centre for Environmental and Marine Studies and Department of Biology, University of Aveiro

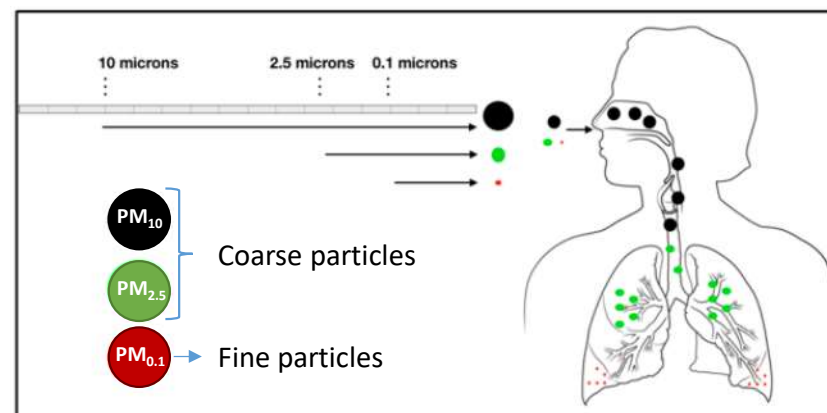
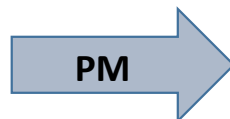
Célia Alves, Centre for Environmental and Marine Studies and Department of Environment and Planning, University of Aveiro

Year of 1st registration: 2020 (Number of full-time equivalent years: 4)

PhD program: Doctoral Programme in Biology

Particulate matter (PM)

➤ Mixture of solid particles and liquid droplets suspended in the air, resulting from a variety of natural and human activities



AIMS

- ✓ Detailed characterization of particulate organic and inorganic compounds emitted from indoor activities by multiple techniques
- ✓ Evaluation of the potential carcinogenic, mutagenic and toxicological effects of these particles towards human cell line models

SAMPLING OF INDOOR SOURCES

Different conditions



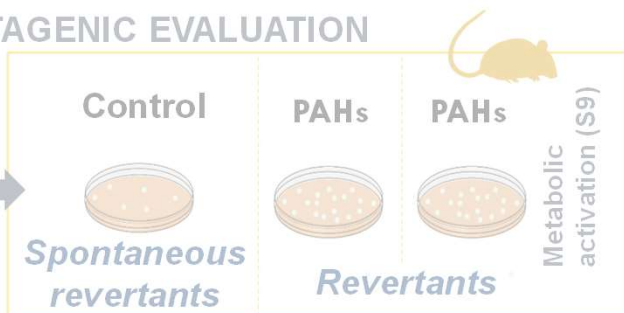
CHEMICAL CHARACTERIZATION OF PM

- ✓ Organic Carbon (OC)
- ✓ Total organic extracts (TOE)
- ✓ Elemental Carbon (EC)
- ✓ Detailed organic speciation (PAHs, resin acids, anhydrosugars, etc.)

TOXICOLOGY: MUTAGENIC EVALUATION

AMES assay

S. typhimurium
TA98/TA100



TOXICOLOGY: IN VITRO SCREENING OF THE LUNG CYTOTOXICITY/GENOTOXICITY

Human lung adenocarcinoma
epithelial cells (A549 cells)

LDH assay

Assess the
loss of cell
membrane
integrity

WST-8 assay

Evaluation of
the cell
metabolic
activity

ROS assay

Detection of
intracellular reactive
oxygen species
(ROS) production

Cell cycle

Detection of
changes in cell
cycle dynamics by
flow cytometry.

SPREADING OF RESULTS

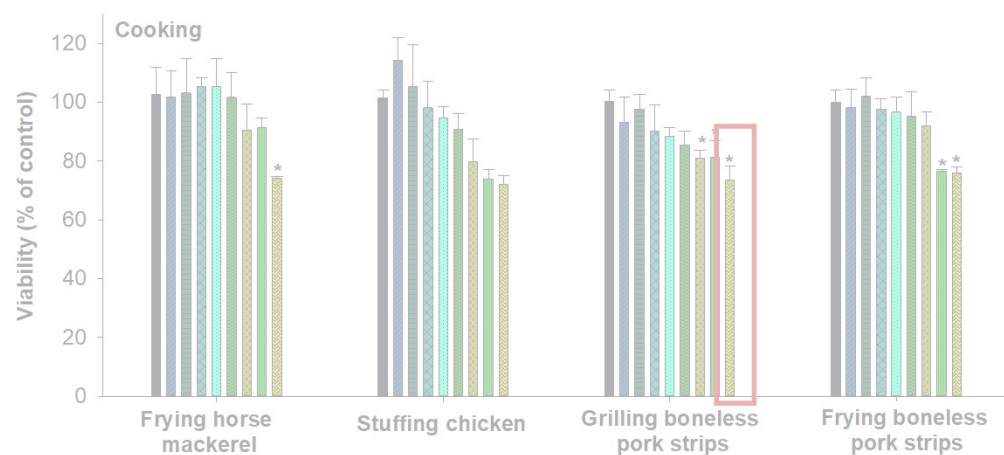


Figure 1. Cell viability of samples from cooking PM₁₀ samples. Asterisks indicate statistical significance.

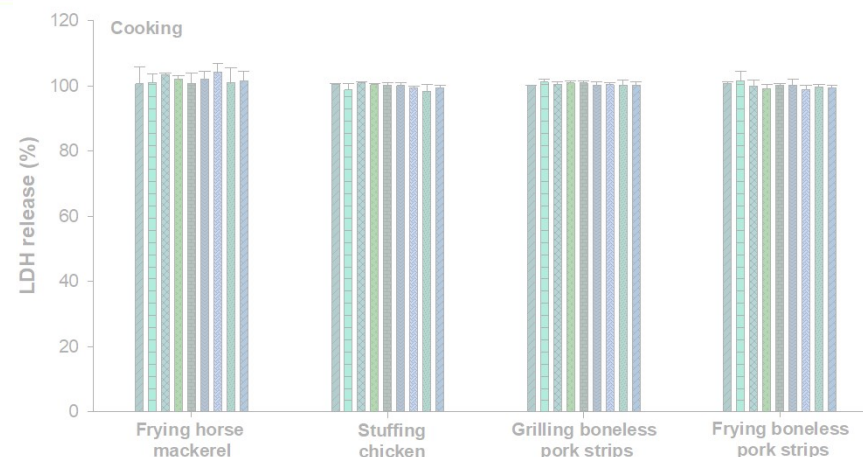


Figure 2. LDH release of samples from cooking PM₁₀ samples.

Table 1. Ratios between number of revertants from samples and negative control for TA98 and TA100 (with and without metabolic activation)

	Mass ng PAHs/plate	TA100 S9 ⁻ Rev/plate	MR	TA100 S9 ⁺ Rev/plate	MR	TA98 S9 ⁻ Rev/plate	MR	TA98 S9 ⁺ Reve/plate	MR
Frying horse mackerel	7,5	154 ± 30	1.0	149 ± 10	0.9	47 ± 33	1.4	23 ± 3	1.0
Stuffing chicken	4,5	153 ± 13	1.0	142 ± 21	0.9	43 ± 28	1.3	22 ± 4	1.0
Grilling boneless pork strips	7,5	156 ± 12	1.0	158 ± 22	0.9	39 ± 16	1.1	24 ± 3	1.0
Frying boneless pork strips	5	142 ± 19	0.9	151 ± 57	0.9	51 ± 16	1.5	21 ± 5	0.9
PC		3818 ± 919	6.2	606 ± 80	3.6	121 ± 16	3.5	172 ± 28	7.4
DMSO		149 ± 11		167 ± 5		34 ± 11		23 ± 7	

Abstracts or proceedings in conferences

D. Figueiredo, E.D. Vicente, A. Vicente, C. Gonçalves, I. Lopes, C. Alves, H. Oliveira·Cytotoxicity and mutagenicity of particulate matter from domestic activities, Jornadas Ibéricas de Toxicologia, 4-5 Jul 2021, Covilhã, Portugal

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Health Day, 1

Future work

Evaluation of the potential carcinogenic, mutagenic and toxicological effects from:

- ✓ PM₁₀ emitted from beauty salons, coffees, 3D printer rooms and floor waxing

Papers

In preparation: D. Figueiredo, E.D. Vicente, A. Vicente, C. Gonçalves, I. Lopes, C. Alves, H. Oliveira·Cytotoxicity and mutagenicity of particulate matter from domestic activities

Vicente E.D., Figueiredo D., Gonçalves C., Lopes I., Oliveira H., Kováts N., Pinheiro T., Alves C.A. (In press) In vitro toxicity of PM₁₀ emissions from residential pellets combustion. *Journal of Environmental Sciences*

Vicente E.D., Figueiredo D., Gonçalves C., Lopes I., Oliveira H., Kováts N., Pinheiro T., Alves C.A. (2021) In vitro toxicity of indoor and outdoor PM₁₀ from residential wood combustion. *Science Of The Total Environment*, 782 146820

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