USE OF DIAGNOSTIC STRAINS OF SALMONELLA/MICROSOME ASSAY TO COMPARE THE MUTAGENICITY OF ATMOSPHERIC PARTICULATE MATTER FROM LIMEIRA AND STOCKHOLM

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Abstract

The air particulate matter (PM) is recognized as mutagenic and this mutagenicity is mainly associated to polycyclic aromatic hydrocarbons (PAHs) and their derivatives, which can be more mutagenic to its precursors. The chemical composition of PM is related to climatic conditions such as temperature and solar radiation. Based on this, the PM samplings were performed in cities with different environmental conditions, in order to compare mutagenicity profiles and chemical composition of organic extracts. The samples chemical characterization was carried out using HPLC-GC/MS, and mutagenicity was evaluated using the Salmonella/microsome assay in microsuspension with different diagnostic strains.

Key words:

total particulate matter (PM), polycyclic aromatic hydrocarbons (PAHs), nitro and oxi-PAHs.

Introduction

Composition of atmospheric PM is influenced by pollution sources, temperature and solar radiation. The average temperatures in Limeira and Stockholm during the winter are 20.4 and -2 °C and sunlight are 11 and 2 h/day respectively. These differences in environmental conditions may result in PM composition and mutagenicity differences especially through photochemical reactions promoting the formation of PAH-derivatives (Burkart et al., 2013)¹, such as oxi-PAHs and nitro-PAHs that not require metabolic activation (S9) to be mutagenic in the Salmonella/microsome assay (Alves et al., 2016)². In general, this derivatives are more mutagenic than their parent PAHs that require metabolic activation. The aim of this work was to compare the mutagenic profile of the organic extracts from pooled total PM samples collected in both cities.

Results and Discussion

Samples were collected during winter in both sites and extracted by accelerated solvent extraction. The extractable organic matters (EOM) of each pool were determined. The Salmonella/microsome microsuspension assay (Image 1) was performed without and with S9 using the strains TA1538, TA98, YG5185 and YG1041.

the strains to the tested samples were YG1041 > TA98 ≈ TA1538 > YG5185. All mutagenic potencies were higher in the absence of S9 for all strains. The differences in environmental conditions of both cities seem not to affect the PM mutagenicity profile, and the higher mutagenicity observed in Limeira is probably only associated with the higher level of PM.

Chart 1: Mutagenic potencies (revertants/m³) of extracts from Limeira and Stockholm, opposite the diagnostic strains with and without S9.

Strains		Mutagenic potencies (rev./m ³)	
		Limeira	Stockholm
TA1538	-S9	151	28
	+S9	89	10
TA98	-S9	160	24
	+S9	18	2
YG5185	-S9	27	4
	+S9	9	2
YG1041	-S9	2400	187
	+S9	400	55

Conclusions

Despite the differences in environmental conditions, the mutagenic profile was similar for both cities. However, the mutagenic potency in Limeira was higher than Stockholm. The higher responses of the YG1041 in relation to TA1538 and TA98 suggests the major contribution of nitro-PAHs to the observed mutagenicity, however chemical analysis are needed to confirm this hypothesis.

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Image 1. Salmonella/microsome microsuspension assay. Mutagenic, potencies in Chart 1, show that in Limeira were up to 13 times higher than in Stockholm, the mutagenic profiles for were very similar. The sensitivity of

¹ Burkart, K.; Nehls, I.; Win, T. e Endlicher, W. *Air Qual. Atmos. Health*. **2013**, 6, 27-38.

² Alves, D. K. M.; Kummrow, F.; Cardoso, A. A.; Morales, D. A. e Umbuzeiro, G. A. *Environ. Mol. Mutagen.* **2016**, 57, 41-50.