



# MUTAGENIC AND GENOTOXIC EFFECT OF PM<sub>0.5</sub> IN DIFFERENT ITALIAN TOWNS : THE MAPEC (Monitoring Air Pollution Effects on Children for supporting public health policy) STUDY



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## INTRODUCTION

Exposure to particulate matter (PM) is associated with respiratory and cardiovascular disease and lung cancer. The finest fractions of PM (PM<sub>2.5</sub> μm and less) play the major role in causing chronic diseases. The structure and composition of PM influence the biological properties of particles.

## MAPEC STUDY: AIM

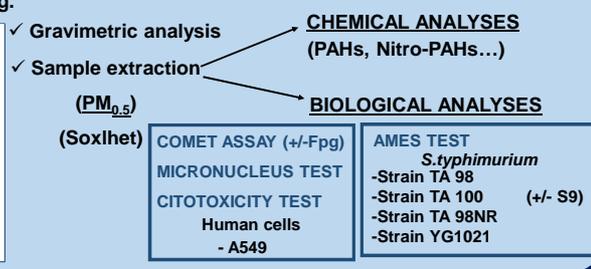
- Evaluate the association between air pollution (in particular PM) and early biomarkers of biological effects in oral mucosa cells of 6-8 year old children recruited from first grade schools in 2 seasons (winter 2014 and spring-summer 2015)
- Propose a model for estimating the global risk of early biological effects due to air pollutants and other factors in school children

## STUDY PURPOSE

- Evaluate children exposure to urban air pollution (PM<sub>0.5</sub>) in 5 Italian towns characterized by different levels of airborne PM
- Investigate the mutagenic and genotoxic effects of PM<sub>0.5</sub> samples

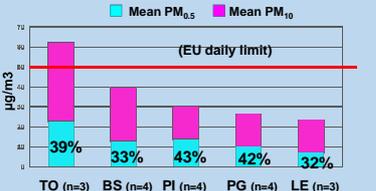
## MATERIALS AND METHODS

- PM<sub>10</sub> with a HiVol multistage cascade impactor (72 h) in the school area, during biological sampling.
- Different fractions: 10.0-7.2, 7.2-3.0, 3.0-1.5, 1.5-0.95, 0.95-0.49, and <0.5 μm
- 2 season (winter 2014 and spring-summer 2015)
- 5 Italian towns (2-4 schools for each town)
  - TORINO (3 schools: TO1-TO2-TO3)
  - BRESCIA (4 schools: BS1-BS2-BS3-BS4)
  - PISA (4 schools: P11-PI2-PI3-PI4)
  - PERUGIA (4 schools: PG1-PG2-PG3-PG4)
  - LECCE (3 schools: LE1-LE2-LE3)



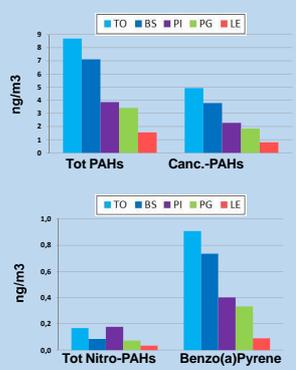
## RESULTS

### GRAVIMETRIC ANALYSIS

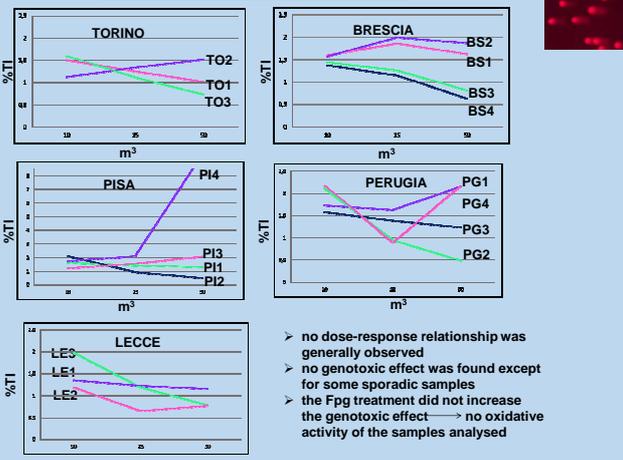


- PM<sub>0.5</sub> represents a very variable percentage of PM<sub>10</sub> (range 19.6-63%)
- PM<sub>10</sub> concentration generally lower than 50 μg/m<sup>3</sup>
- The highest values of PM<sub>10</sub> were observed in the towns of the Padania Plain (Torino and Brescia)

### CHEMICAL ANALYSIS



### COMET ASSAY



### AMES TEST

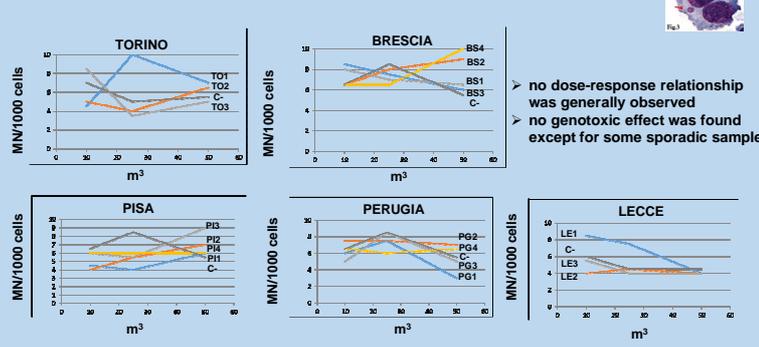
SITE	Net revertants/m <sup>3</sup>							
	- S9				+ S9			
	TA100	TA98	TA98NR	YG1021	TA100	TA98	TA98NR	YG1021
<b>BRESCIA</b>								
BS 1	-	0.5	-	7.7	-	-	-	12.9
BS 2	-	0.4	-	10.7	-	0.9	-	16.8
BS 3	-	-	-	9.7	-	0.6	-	14.6
BS 4	-	0.6	-	7.6	-	1.0	-	20.0
<b>TORINO</b>								
TO 1	4.8	1.3	1.0	30.8	-	1.5	0.9	34.3
TO 2	3.0	1.5	1.2	16.5	-	1.9	0.9	35.8
TO 3	-	0.9	0.6	17.7	-	1.0	0.7	36.6
<b>PISA</b>								
PI 1	-	-	-	1.9	-	-	-	3.0
PI 2	-	-	-	2.9	-	0.7	-	7.0
PI 3	-	-	-	7.4	-	0.9	-	14.3
PI 4	-	0.8	-	6.8	-	0.8	-	19.8
<b>PERUGIA</b>								
PG 1	-	0.5	-	7.2	-	0.9	-	16.4
PG 2	-	0.3	-	7.1	-	0.6	-	17.8
PG 3	-	-	-	3.0	-	-	-	7.2
PG 4	-	0.4	-	3.4	-	-	-	10.1
<b>LECCE</b>								
LE 1	-	0.4	-	1.7	-	-	-	4.8
LE 2	-	0.5	0.4	4.5	-	0.6	-	8.2
LE 3	-	-	-	1.4	-	-	-	2.5

**TA100**  
 - Mutagenic effect in TO1, TO2 samples  
**TA98**  
 - All samples with at least one mutagenic dose  
 - Low mutagenic effects  
 - The highest effect in TO1 and TO2  
 Slight increase +S9 presence of indirect mutagens (PAHs)

**TA98NR**  
 - Slight decrease of the effect in BS1, BS2, BS4, TO1, TO2, TO3, PI4, PG1, PG2, PG4, LE1, LE2 samples  
 presence of nitroaromatic compounds (Nitro-PAHs)

**YG1021**  
 - All sample showed mutagenic effect  
 - The highest effect in TO1, TO2 and TO3  
 presence of nitroaromatic compounds (e.g. Nitro-PAHs)

### MICRONUCLEUS TEST



The low genotoxic/oxidative and mutagenic activity of the PM<sub>0.5</sub> winter extracts could be related to the low level of air pollution observed in this winter sampling associated to a high atmospheric instability.

## CONCLUSIONS

- The high variability of PM<sub>0.5</sub> observed in this study should be more investigated.
- For a greater understanding of the relationship between PM size, composition and biological effects, the results obtained in this study suggest to investigate also the biological effect of the other PM fractions and in particular of the PM<sub>0.5-1</sub> fraction.