[P-15]

Diffusion Flame-Derived Fine Particulate Matters (PMs) with Iron Showed Genotoxic Potential in B6C3F1 Mice

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Potential genotoxic effects of diffusion flame-derived particulate matters (PMs), known to cause various adverse health problems, with iron, one of the representative heavy metals frequently found in the atmosphere, were examined. B6C3F1 mice were exposed to PMs [chamber 1(low), 100; chamber 2 (middle), 200; and chamber 3 (high), 400 $\mu g/m^3$] 6 hr/day, 5 days/week for 1, 2, and 4 weeks in 1.5-m3 whole-body inhalation chambers. Our diffusion flame system produced 94.8 and 5.2% fine PM2.5 and PM10, respectively, with 89% of PM2.5 sized between 0.1- 0.2μm. Fine PMs generated also included various noxious gases such as benzene. Two cytogenetic endpoints were investigated through chromosomal aberration and supravital micronucleus (SMN) assays. Frequencies of cells with chromosome aberration (%) were observed in time- and concentration-dependent manners except in 1-week exposure group, as also observed in SMN study. Generally, non-iron flame induced less chromosome aberration than iron-doped flame, an indication that iron particle could potentiate urban PM toxicity. Above results indicate our diffusion flame system generated genotoxic fine PMs, whose effects were potentiated by organo metallic particles. Our system can provide reliable PM models for studying the toxicity of urban fine PMs applicable for risk assessment.

Keyword: Diffusion flame system, Particulate matters (PMs), iron, chromosomal aberration (CA), supravital micronucleus (SMN)