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Bioassay-Directed Chemical Analysis of Mutagens in Diesel Exhaust Particulate Matter (Dep)

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It has been reported that exposure to particulate matter is linked to increase lung cancer risk. Recently it is confirmed that diesel exhaust particulate matter (DEP), which derives from diesel powered vehicles, is contributed as a major pollutant in urban air-borne particulate matter. Diesel exhaust is a complex mixture of carbon particles and associated organics and inorganics. DEP is known to be contained numerous genotoxic carcinogens. In order to identify which chemical classes are responsible for the majority of the observed biological activities, this research was designed to examine the presence of mutagenic/carcinogenic compounds and quantitatively assess the genotoxic effects in DEP. Respirable particulate matter (PM2.5: <2.5㎛) was collected from diesel engine exhaust using a high-volume sampler equipped with a cascade impactor. Particulate organic matter was extracted by the dichloromethane/sonication method and the crude extract was fractionated according to EPA recommended procedure into seven fractions by acid-base partitioning and silica-gel column chromatography. We examined genotoxic potentials of diesel exhaust particulate matter using novel genotoxicity tests, which are rapid, simple and sensitive methods for assessing toxic effects at the DNA and chromosomal level (comet assay, in vitro MN test and Ames test). Also, to identify the causative chemicals, we performed the bioassay-directed chemical analysis which is the approach to classify the major chemicals in the fraction of most biological activity. Several mutagenic PAHs, such as 1,2,5,6 dibenzanthracene, chrysene, 1,2-benzanthracene, phenanthrene and fluoranthene were detected by GC-MS in non polar fractions. Total toxicity was calculated as biological TCDD equivalent concentration (Bio-TEQ) and compared with I-TEQ.

Keyword : DEP, Bioassay-directed chemacal analysis, Mutagen